WESTERN BLISTER RUST NEWS LETTER

By the

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WESTERN BLISTER RUST

NEWS LETTER

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

THE SCIENTIFIC ATTITUDE

S. N. Wyckoff

The following quotation from "Science and the New Civilization" by the noted physicist Robert A. Millikan seems to me to be such an apt expression of the scientific attitude as to merit our attention and thought.

"As soon as the public learns, as it is slowly learning, that science, universally recognized as the basis of our civilization, knows no such thing as change for the sake of change, as soon as the public learns that the method of science is not to discard the past, but always to build upon it, to incorporate the great bulk of it into the framework of the present, as soon as it learns that in science truth once discovered always remains truth, in a word that evolution, growth, not revolution, is its method, it will, I hope, begin to banish its present craze for the sensational, for the new regardless of the true, and thereby atone for one of the sins into which the very rapid growth of science may have tempted it."

We can, for the moment, think of ourselves as part of Millikan's public without thereby too harshly accusing ourselves of the faults he mentions. We can surely set up his words as a guard against too hasty action or thought. By its very nature, our work possibly submits us to temptations of the special type which Millikan points out. Due to our urgent need for immediate results from experimental work, it is possibly too easy for us to discard one idea in favor of another of more alluring appearance. Do we build upon our past work, or are we too prone to cast it aside? If it was well planned and carefully performed, it must contain facts of value, possibly only needing correct interpretation.

I am frequently struck with the really large amount of information, on various phases of our work, to be found in our past reports. To what extent are we using this information? Are we making an honest effort to interpret it in light of our present knowledge, or are we merely accepting the original conclusions and from them deciding with unwarranted facility that the underlying facts have no value?

TESTING THE RELIABILITY OF CHECKING METHODS

H. N. Putnam

In measuring the effectiveness of Ribes eradication, we have arbitrarily set 50 feet of live stem per acre as the maximum. In the measure of Ribes, two considerations are of importance: (1) distribution and (2) amount.

To measure these factors we run .2-chain wide strips at 10-chain intervals through areas worked. This constitutes an impartial 2% check. Data on number of bushes and feet of live stem by species are taken in chain transects. Heretofore we have had no idea how accurately our 2% estimate conforms with actual conditions. The ideal way to measure this accuracy would be to compare data from both a 100% and a 2% check of the same area. The cost of a sufficiently large study of this kind would be prohibitive.

However, it is possible to make exactly this type of study by using the total acreage of strip data as an area checked 100%.

The checking figures from 4,330 chains on 86.6 acres of strip were used. This strip area includes several eradication types, chiefly open reproduction. It has been assumed that the eradication type has no influence on the error of estimate in our checking method so all types have been grouped. The same assumption obtains in our actual checking work since we run a 2% cruise over all eradication types except stream type, where a 4% cruise is run.

To study the accuracy of a given per cent check we used only the Ribes data from those chain units which gave the desired per cent estimate, and compared these with the complete Ribes data on all chains. Thus to obtain a 50% check we counted every other chain; 25% check every fourth chain and so on down to a 1% check where every 100th chain was used.

It may be argued that in taking, for example, every 50th chain in a 2% check, our sample would not be as representative as it would if we took 1/50th of each chain. Since the chain is our smallest unit, it is impossible to distribute our samples in smaller units. However, in taking every 50th chain, we are sampling the strip area on exactly the same basis as we sampled the original area. In a 2% check we use strips 1/5th of a chain wide and 10 chains apart which give 50 strip width units between strips. Considering the area of this study as a continuous strip 4,330 chains long, we get a 2% sample by taking every 50th unit which is identically the method used in our original sampling of the area.

In the table the number of bushes and feet of live stem per acre by species are shown for eight sample per cents.

RIBES PER ACRE COMPUTED FROM VARIOUS INTENSITIES OF SAMPLING

Per Cent Check	Chains in Strips	Acres in Strips	Per Cent Chains With Ribes	Ribes Per Acre						Per Cent Variation F.L.S.
				R. lac.		R. visco.		Total		
				Bu.	F.L.S.	Bu.	F.L.S.	Bu.	F.L.S.	
100	4,330	86.60	3.0	0.9	11.2	1.4	7.4	2.3	18.6	0.0
50	2,165	43.30	2.9	0.8	13.9	1.6	6.7	2.4	20.6	+10.8
25	1,082	21.64	3.1	0.6	9.1	1.7	8.9	2.3	18.0	-3.2
10	433	8.66	3.2	0.7	3.2	1.7	11.2	2.4	14.4	-22.5
8	346	6.92	2.9	0.6	3.6	1.7	10.0	2.3	13.6	-26.9
4	173	3.46	4.6	1.2	7.2	2.0	16.5	3.2	23.7	+27.4
2	86	1.72	3.5	0	0	1.7	23.3	1.7	23.3	+25.3
1	43	.86	2.3	0	0	1.2	9.3	1.2	9.3	-50.0

In the fourth column which is indicative of Ribes distribution there is not a wide divergence of results between the smaller samplings and the 100% check.

The lowest per cent cruise (1%) shows a distribution only 23% smaller than actual. The 4% shows the highest departure with slightly over 50% more chains showing Ribes than actual. The 50%, 25% and 8% samplings are closest to actual.

In general, the per cent of error in live stem becomes greater as the per cent check is smaller. The 50% and 25% checks are fairly close to actual but the 10%, 8%, 4% and 2% checks, which are quite similar, have an average departure of about 25%. In other words, there is no appreciable increase in accuracy of estimate from 2% to 10% in this case. If this same trend exists in an extension of this study, it would certainly be important.

Although there is a fairly close correlation when both Ribes species are considered together, there is a decided variation when each is taken separately. For R. lacustre the 50% check showed more live stem per acre than actual, while the other 6 checks showed less. For R. viscosissimum all estimates except the 50% show more live stem per acre than actual.

The high variation in R. lacustre resulted from the influence of one chain with 5 bushes having over 300 feet of live stem. All other chains with R. lacustre had 65 or less feet of live stem each. The chain showing the large amount of R. lacustre came in the 50% check which threw that estimate high. In the chains with R. viscosissimum the samples were higher than the actual because of one chain having one bush with 70 feet of live stem which fell in all of the samples except the 1%. The wide variation when each species is considered separately illustrates the distorting effect of one erratic sample when an insufficient number of samples is taken.

We are particularly interested in a 2% check because we believe it is adequate and allowable in cost. No R. lacustre bushes are found in the 2% sample and there are approximately 4 times the R. viscosissimum live stem per acre than actually existed. However, the total live stem per acre for the 2% check is only 25% higher than the average.

The 25% error of estimate in a 2% check should be considered as an acceptable error. If similar studies of several areas showing a 2% check vary no more than 25% from actual, we would conclude that a 2% check is sufficiently accurate.

FOXTAIL PINE (PINUS BALFOURIANA) ON BLACK BUTTE

G. A. Root

Not far from majestic Mt. Shasta in southern Siskiyou County there arises from the plateau floor a large cinder cone known as Black Butte. Perched atop this prominence is a lookout station reached by a winding trail along which may be found much of interest to the blister rust scout. There are three species of 5-needled pines, P. lambertiana, P. monticola and P. balfouriana, the latter near the summit. Four species of Ribes are noted, R. roezli, R. nevadense, R. hallii and R. cereum. Besides offering good inspection points for blister rust, this location is mentioned because of the ease with which Foxtail Pine, a little known species, may be reached for study or to obtain specimens and seeds.

SOME COMMENTS ON THE ERADICATION OF R. INERME

H. R. Offord

The sempiternal difficulties to be met in the problem of eradicating *Ribes inerme* from north Idaho stream type are so well appreciated by the Blister Rust personnel that they need no introductory review; and although a new figure, in the shape of *R. viscosissimum*, has recently appeared before us, the spectre of *R. inerme* still haunts the corridors of our meetings, a rude reminder of the problem that awaits us in the field. The effective manner in which chemical methods laid the ghost of *R. petiolare* has undoubtedly prejudiced us in favor of a similar scheme for *R. inerme*. Thus, our cry has been for a treatment which could be applied to *R. inerme* wherever encountered, in spite of the fact that a short discussion of the feasibility of each plan, as suggested by its sponsor, made clear the shortcomings of that method if regarded in the light of a general panacea. Some comments on these several ideas for eradication of *R. inerme* with particular reference to the status of chemical work are given herein. This paper also suggests a scheme for classifying *R. inerme* brush land into types as a basis for subsequent working by different eradication methods.

Possible Methods for Eradication of R. inerme

At one time or another hand pulling, chemicals, mechanical equipment, fire, flooding or draining, and predatory plant or animal organisms have been suggested as possible agencies for the suppression of stream type Ribes. A brief survey of the field of permutations shows that the use of these six agencies, either singly or in groups of two or more, would result in 1,236 possible arrangements which might be considered for the eradication of any one area. Obviously it would be practical neither to undertake such a large number of experiments nor evaluate their results. It is possible, however, on the basis of past experience to judge which eradication schemes would be most likely to succeed.

On this basis, biological methods can be ruled out because of the emergency aspect of stream type eradication. While flooding might be used as an eradication tool in a few favorable sites, it could hardly be considered as an effective killing agent. The draining of swamp land prior to treatment by bulldozer or by chemicals is certainly to be recommended as a sound practice, though the method in itself could hardly be expected to accomplish effective suppression of Ribes. Broadcast burning of brush is strongly suggested for use in areas which are favorably situated and constituted. Preliminary treatment by spraying with cheap oil or by slashing and piling some brush may be needed to secure a satisfactory burn. Any method of broadcast burning would also require a follow-up method of hand pulling, but from observations of burned areas, it is certain that the follow-up method would be quite inexpensive. On the say-so of the most experienced, hand pulling alone contains some element of the physically impossible plus a very considerable element of the economically unfeasible. At the present moment mechanical methods for cleaning up the more extensive areas of stream type are high in public esteem. Judged solely on the ability to eradicate Ribes and brush, a combination of the bulldozer and an auxiliary unit such as a mechanical hoist approaches the ideal of a universal method. In this combination, the hoist would serve to prepare the ground for

bulldozer work by yarding out large windfalls and incidentally breaking up beaver dams. The use of such equipment, however, will certainly be limited partly by considerations of transportation, partly by the number of units which can be purchased, and partly by topographic features of the area to be worked; swampy ground which cannot be conveniently drained constitutes a real hazard to the operation of the bulldozer. Chemical methods alone hold little hope as a means for attaining desired results. Certain areas, by virtue of high water and tangled masses of brush, are almost impossible to work, whereas other types must be treated with such large quantities of chemical that the treatment proves too costly. However, a combination of mechanical and chemical, or hand pulling and chemical methods does seem practical. As an illustration of the first mentioned combination and its possibilities it might be pointed out that those areas, which by virtue of high water and windfalls are least vulnerable to chemical treatment, might actually become most susceptible, if given a preliminary grooming with a small mechanical hoist to remove logs and break down beaver dams. R. inerme plants growing in such areas (if the plants have been under hydrophytic conditions for some time) may be shallow rooted and would receive an appreciable set-back by the lowering of the water level. While no field test has been made of this point the possibility of converting the most difficult type into the least difficult type is not out of line with our best advance information.

Consideration of the points advanced in the above paragraph clearly shows the impossibility of finding any one method which could be unversally applied to the eradication of stream type R. inerme. Yet broadcast burning, mechanical eradication, chemical eradication, draining, flooding and hand pulling all have potentialities which should be considered in the light of the peculiar characteristics of various individual areas before proceeding with a plan for eradication.

Selection of a Method for Specific Areas

In order to place these various methods in their proper relation one might formulate a general work plan for stream type eradication. On the basis of all general information and field data to hand, divide R. inerme areas into three classes to be handled as follows:

Class A. Extensive areas of bottom land such as the Clarkia and Honeysuckle regions which are characterized by alluvial soil capable of producing hay or alfalfa, particularly such areas as are strategically located for distribution and use of the products grown therein. These areas should be classified for eradication by mechanical means and should be considered as permanently converted from brush land to agricultural land. In drawing up this program the total acreage designated should be kept within the bounds of sound policies of land use. Presumably the scope of such work will be dictated by the funds available for the purchase of mechanical equipment.

Class B. Areas of stream type comprising poorer soil, and more rugged topography than Class A areas, particularly when far removed from trading centers, Forest Service depots and transportation facilities. Such areas

should be cleared of brush and Ribes by an initial method of burning followed by hand eradication of surviving root centers and subsequently turned into grass land for grazing purposes. This classification may be a small one due to the limitations imposed by the burning operation.

Class C. All areas not covered under Classes A and B, such as: (1) areas unsuited for permanent suppression of Ribes by methods whose cost might be considered as "partially self-liquidating"; (2) areas which cannot be handled by mechanical methods by reason of swampy ground, rugged topography or need for extensive movement of heavy equipment; (3) areas which cannot be handled by a controlled burning because of special fire hazards or political expediency. Such areas should be cleared of Ribes by a combination of hand pulling and chemical methods.

Eradication of R. inerme by a Combination Method of Hand Pulling and Chemicals

In considering the eradication of R. inerme by a combination method of hand pulling and chemicals, an early season survey of the area should be made by the field supervisor to determine in a general way such characteristics as extent, density and kind of brush, irregularities in stream flow, beaver dams, number and size of windfalls, and general soil characteristics. Since water level and number of beaver dams will vary greatly from year to year, this survey should be made in the spring season just prior to eradication. On the basis of these data, the general requirements for the job in the way of mechanical equipment and chemicals can be decided by a conference of project supervisors. Provided that no preliminary treatment of the area is needed for excessive windfall or high water, the first step in the actual eradication would be a combination job of mapping the area and hand pulling of single Ribes bushes and scattered small ones. The camp boss and two or three crew men would work over the area in lanes or strips, such as are used in spraying R. petiolare, so that laying string lines, pulling scattered Ribes, and mapping, go on simultaneously. The prime functions of the camp boss would be to prepare the map and check behind the crew. Data on kind, density of Ribes, brush conditions, water level and type of soil are to be recorded so that a proper map can be prepared at the conclusion of the survey. The prime functions of the crew men would be to lay string lines, pull Ribes and furnish the camp boss with additional data on Ribes and brush conditions, if poor visibility should prevent the recorder from seeing them himself; it is particularly important that long runners be pulled and thrown into the central clump or at least partially uprooted to indicate the extent of underground spread. Thus, the Ribes marked for chemical treatment are concentrated into clumps or units. Such clumps or units might be further marked by a line of paper. Work to the value of three dollars per acre might be set up as a rough indication of the scope of this initial treatment. After the ground has been surveyed, mapped and given its preliminary grooming by hand pulling methods, the Ribes clumps or ground units containing the heavy Ribes population should be well soaked down with aqueous sodium chlorate. A small power outfit suitable for a more or less selective application or knapsack equipment might be employed for this job. The following year a final clean-up job of hand eradication may be necessary.

A critical analysis of all past experiments undertaken by this project shows very clearly that scattered small bushes take a disproportionately high quantity of chemical per bush or per 100 feet of live stem to insure death. If these bushes are removed from any given area by some cheaper method than chemical means, a tremendous saving both of time and chemical can be effected. For the more or less solid blocks of R. inerme which remain on the area following the initial hand pulling treatment, the following dosages are recommended:

Type Under Treatment	Concentration in Lbs. Per Gal. of Water	Gallons Per Sq. Rod	Gallons Per Acre	Pounds Per Sq. Rod	Pounds Per Acre	Approximate Equivalent in Lbs. Per Acre. Old Type Selective Application	Pounds Per 100 Ft. Live Stem	Lbs. Per Bush
(a) Sand bar	1	(c) 30	4,800	30	4,800	350	3	0.3
(b) Bench	1	50	8,000	50	8,000	583	5	0.5

(a) Includes swamp type converted into dry land by draining.

(b) Figures for this type are based partly on analysis of Santa data and partly on early observations at Wenatchee. These figures should be considered as the practical limits of chemical eradication. Some dry land forms of R. inerme may run considerably higher than this.

(c) The same basic figures in this table have, on several occasions, been arrived at quite independently by Van Atta and the writer using different methods of calculation and different field data.

In conclusion it is pointed out that significant data cannot be expected from an elaborate scheme of experimentation on the eradication of R. inerme by various combination methods of hand, chemical, mechanical, burning, flooding and draining. The thesis is advanced that variations in topography, soil, water level, brush conditions, number of Ribes, and transportation problems make each drainage or brush area a problem in itself; and the difficulty of evaluating cost figures, in consideration of these variables, would certainly invalidate experimental data secured from small local areas. Thus, our whole eradication force might be considered as a methods organization in so far as the eradication of R. inerme is concerned. In regard to chemical work, it is believed that although there may be several ecological forms of R. inerme all of which might be eradicated by certain theoretical dosages, in reality there are only two types of R. inerme with which we have to deal; namely, that which can be eradicated by chemical means at a reasonable cost and that which is beyond the economic pale. By pooling the opinions of those project leaders responsible for the different types of work it should be possible to classify our stream type and adopt a more or less systematic method of treating R. inerme.

PEPPING UP THE PERSONNEL MEETINGS
B. A. Anderson

When first established at Spokane, the Western Office of Blister Rust Control occupied two rooms in the Realty Building. If a problem of importance needed solution or a memorandum from the Eastern Office necessitated discussion, a slight raising of the voice was sufficient to inform the entire staff of one's opinions. But as the expanding program of blister rust control necessitated additional permanent members, it became necessary to add more and more office space. As the personnel increased the old "whoop and holler" system of personnel meeting proved inadequate. Instead, a two or three-hour monthly get-together took its place.

These meetings have been utilized by department heads for the explanation of various memoranda, regulations and policies; project leaders have taken this opportunity to acquaint the rest of the office with the details of their work; at times fiery discussions have arisen over debatable questions. Occasionally the meetings have been given over to speakers from offices whose work is allied to blister rust control. But like any organization which is allowed to drift along without constant attention, revision and bolstering, the monthly personnel meeting gradually lost much of its value. Since it was not performing the functions for which it had been originally created, a committee was appointed to reorganize the meetings. Following a canvass of the office, the committee outlined a constructive program from the suggestions offered. The most important changes included the following: a provision for future meetings of two hours duration to be held twice a month; the appointment of a discussion leader for each subject presented; and an outline of subjects and speakers for future meetings. Some of the subjects that will be discussed during the winter are practical demonstration of age of cankers, photography in blister rust control, white pine beetles, statistical methods, and developments in Ribes eradication methods. To acquaint the personnel of the Division located outside the Spokane office with the content of these meetings, a summary of the subjects will be presented in the News Letter.

The meeting in December was opened by H. N. Putnam with the talk, "Blister Rust Work in the Lake States". He spoke of the splendid cooperation he has received, the status of the work in that region, and the use of the unemployed on blister rust control. Two U.S. Department of Agriculture films on forestry subjects were shown.

Three talks were given at the January 4th meeting. R. E. Myers gave a resume of the work carried on at Newman Lake, Washington. Roy Blomstrom explained the work being done by Benedict, Harris and Miller on the sugar pine inventory in California. Since annual reports are now being whipped into shape, Mr. Wyckoff's discourse "The Preparation of Scientific Papers" was most timely.

If the interest and discussion evinced at the first two meetings are an indication of what may be expected from future meetings, the success of the new program is assured.

THE SUGAR PINE INVENTORY IN CALIFORNIA

Roy Blomstrom

The importance of an inventory and evaluation of the sugar pine resources of California as a guide in determining what course to follow if and when blister rust enters the state has long been realized. The Forest Service detailed one man to assist W. V. Benedict and T. H. Harris with this study. Work was started June 1, 1932.

The same general procedure is followed for each forest. All cruise records, both Federal and private, are examined. Sugar pine volumes are recorded by forties and each forty designated as a pine or fir type on the basis of amounts of associated species. Original cruise records for logged areas are recorded and cutting areas delimited. Cruise records are available for approximately 85 per cent of the sugar pine type.

With the completion of the cruise records for a forest an ownership map is prepared by townships, for all sugar pine types.

A percentage figure would not do to designate what constitutes a sugar pine type. A small percentage of sugar pine on good timber lands would represent a respectable volume. On the contrary in an open poor site a high percentage of pine might represent a negligible volume. After comparing minimum sugar pine type designations prepared on a percentage basis (15% of a stand by volume) it was decided that 3,000 board feet per acre most nearly agreed with existing type maps, chiefly blister rust reconnaissance maps. Areas on which there is no existing information are filled in by field mapping. Cruise records in the hands of private operators are solicited individually, others secured from the forest headquarters.

The second major step is the office job of analyzing the cruise records, preparing the type map and tabular statements. With many sources of information it was necessary to establish an order of priority in evaluating the data for the type map. Blister rust reconnaissance data are retained intact. Cruise figures are utilized where no blister rust type maps have been made. Any other available sources of information are used to fill in remaining areas.

Following the construction of the type map comes the tabulation of final data. When completed the inventory will show:

1. The area of sugar pine type.
2. The volume of sugar pine.
3. The location and ownership of the sugar pine.
4. What should be protected and order for doing it, based on volume and ownership. The sugar pine producing capacity is determined for cruise records.
5. How much it will cost to protect the pine. Blister rust reconnaissance data and experimental Ribes eradication data will be used to supply this information.

To date, field data are practically all assembled with the principal sugar pine forests to be completed by the advent of the field season.

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U. S. Department of Agriculture
Bureau of Plant Industry
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ERADICATION OF RIBES INERME AS SEEN BY AN ERADICATOR

H. E. Swanson

The subject of the eradication of *Ribes inerme* was opened up very thoroughly in the last issue of the News Letter by a chemical investigator. A review was given of the development of the various methods and the extent of the problem along with certain contributions for its solution.

An eradicator cannot help but view the problem in the light of the numerous areas of stream type covered with tangled masses of Ribes and brush which he has been battling for several years. He has seen men go after the Ribes with bare hands, he has seen men try to poison them with chemical, and he has seen a man ride a mechanical giant roughshod over the area. He knows to a certain extent the limitations of each method, but he knows very little of the full possibilities of the chemical and bulldozer. Consequently he is in full agreement with his cooperator in chemical investigation in the belief that it will be difficult if not impossible to find "any one method which could be universally applied to the eradication of stream type *R. inerme*", and also that "the peculiar characteristics of various individual areas" must be considered before proceeding with any plan of eradication. This is exactly what the eradication forces have been doing.

However, the eradicator cannot agree with the plan of classifying stream type areas as suggested. Such a plan is in direct contradiction to the above suggestion and present practice of considering the peculiar conditions present on each individual area. If there are more than a thousand different combinations of methods for working areas there are more variations in the individual characteristics of stream type areas. To reduce these to three classes, which leave out the most important consideration of all, the abundance of *R. inerme*, is not the proper procedure for placing the "various methods in their proper relation" for formulating a "general work plan for stream type eradication". As a matter of fact this was done not so long ago, although in the light of fewer methods, by those carrying on control operations. The plan was abandoned for the more practical plan of considering the conditions on each individual area.

Another approach to the problem, if not a better one, is at least essential, and that is the continuation and completion of the experimental program with chemicals and bulldozer in order that the possibilities of each might be fully known. Then an intelligent decision can be made on how to work an area and an accurate estimate made on the cost of that work. Chemical and bulldozer methods were only mentioned as requiring further experimentation as the scope and possibilities of hand pulling methods have been fairly well established.

For reasons obvious to eradication men the plan suggested for carrying out a combination method of hand pulling and chemical eradication of *R. inerme* cannot be followed. In the first place an early spring survey cannot be made because chemicals, equipment and men go into an area at the earliest possible moment. Equipment and supplies must be purchased and men hired as early as March or April. The detailed plan as suggested for mapping areas for hand pulling and spraying was given a thorough trial in 1928 at

Haugan, Montana and Bovill, Idaho. It was discarded because of the high costs resulting from its use and also the decrease in efficiency resulting from missed areas. However, it is essential to have a map of the area locating the heavy concentrations of Ribes, beaver dams, swamps, etc. The present methods used in stream type are a combination of hand pulling and chemical methods, which can be easily and readily adapted to R. inerme areas.

The little hope that was held out for chemical methods in the previous article is not surprising in the light of the amount of chemical recommended as necessary to kill R. inerme. If these amounts are necessary, which represent costs of $408 and $680 per acre for chemical alone on area actually covered, an eradicator would say that there is no hope for chemical methods. The cost of chemical, sodium chlorate in this case, is computed at $.085 per pound laid down on the job.

There is one very important step involved in the treatment of R. inerme with chemicals which is given no consideration in these recommendations. That is the respraying of areas. The success of a practical method of treatment of R. inerme is tied up with this respray and to endeavor to apply enough chemical in one application to do the job is carrying the thing to the point of absurdity.

The eradicator does have hope for this method because he has seen chemicals used in amounts representing only a small fraction of those which were recommended producing excellent results. The chemical eradication methods unit last summer was using amounts of chemical on work resembling a practical job costing from $18 to $36 per acre; the first figure representing the cost of a selective treatment covering approximately 25% of the entire area and the latter figure the cost of a broadcast treatment covering the entire area. On experimental plots the costs of chemical ranged from $27 to $136 per acre. The costs include the chemical used on the respray. Some excellent results were secured through the entire schedule. Similar work done in 1929 and 1931 on other areas has proved satisfactory.

Although the work was done entirely on the Clearwater National Forest, it was done on three different areas, each of which had within itself a wide variation in conditions. The theory on which this work is based is that a certain amount of R. inerme will be killed out with a single light dosage of chemical and the remainder will be sufficiently injured that a respray will wipe it out. This method has killed R. inerme regardless of depth of roots. It is an unwarranted waste of chemical to apply over an entire area an amount necessary to kill the most resistant bush. Also it is possible to do clean-up work on these areas by hand pulling methods. This is where the real and effective combination of hand and chemical methods will be found. The real problem of chemical eradication methods is now to coordinate the first and second treatments for the most effective and economical use of chemical.

No effort has been made to enumerate all the variations in selective and broadcast spraying, treatment of stems and leaves, and soil drenches.

which make up the experimental program. Nor have the problems of eradication by the bulldozer, which has had only 460 hours on this work, and the burning of brush been discussed.

In the light of the present emergency, "pooling the opinions of project leaders" is advisable. This is always a source of ideas which may be productive in the development of satisfactory methods. The aim of this article has been to show that there is yet to be gathered by hard intensive work and investigation certain fundamental information on all methods of eradication on which to base a sound decision as to the most economical and satisfactory method of working an area.

SOME ASPECTS OF ECOLOGY RELATING TO CHEMICAL ERADICATION

G. R. Van Atta

Nearly all of us can readily recall numerous instances in which apparently anomalous results have followed the application of chemicals to Ribes in the field. The species that has exhibited the greatest irregularity of response in the past has been *Ribes inerme*, although even *Ribes petiolare* has occasionally shown marked variability in the same respect.

Experience has gradually brought out the fact that the degree of susceptibility to chemicals displayed by *Ribes inerme* is related in some way to the type of site upon which the plants occur. The size and configuration of the aerial parts of the plants concerned do not always correspond in a regular manner with the reaction to spray chemicals although it is often true that *Ribes inerme* plants growing at the centers of large, dense clumps of the species are killed by spray treatments that fail to kill other bushes not so situated. In ordinary spraying practice the surface of the soil is fairly well soaked with chemical solution for some distance around the individual plants located within large clumps. The two foregoing observations furnish a clue regarding a part of the mechanism by which injury to the plants is produced. The suspicion that the soil, or rather the soil solution, is an important medium through which the plants are fatally damaged in these somewhat unusual instances is strengthened by a number of other facts only two of which will be mentioned at this time. Early experiments, as well as some performed more recently, have shown that certain chemicals when applied only to the soil at the bases of the plants are relatively quite effective for killing *R. inerme*. Here again the results of the tests have not been perfectly uniform although the disagreement is not of very high order.

Another observation taken from field experience and bearing upon the present topic has to do with the character and condition of the soil and the habits of *R. inerme* root development as apparently related to the response shown by the plants to chlorate sprays. Certain of the areas upon which the highest percentages of *R. inerme* bush kills were achieved have been found to be distinguished from most others less successfully treated by their very light sandy soils and the prevalence there of extremely shallow Ribes root systems.

These observations seem to indicate possibilities for improvement in the technic of chemical treatment as well as a means for discriminating between several types of *R. inerme* prior to the application of chemicals. It was with

this thought in mind that certain preliminary investigations were undertaken during the last field season. For want of a better name these inquiries have been termed "Root Studies" although they concerned the gross morphology of the whole plant. Particular attention, however, was given not only to the Ribes roots but to all the hypogean plant parts and the soil immediately surrounding them. _R. inerme_ and _R. petiolare_ were the only species examined thus far and the work conducted in this field to date can be regarded as little more than an orientation survey; however, some facts that appear significant have been established tentatively. For example, light soil and shallow roots favor the destruction of Ribes by chemicals. The converse is true of heavy soil and deep roots. The mere presence of water in such soil is not necessarily the only factor operative in inhibiting root penetration since Ribes roots develop freely in well aerated water. Water that is well aerated does not hinder Ribes root development.

Simple points such as these can hardly be regarded as new, but it is believed that as they become better understood, important practical advantage can be taken of them in planning future eradication programs.

TELIOSPORES AND SPORIDIA

C. C. Strong

While participating in or listening to discussions regarding the width of protection zone needed around white pine in protecting it against blister rust, the writer has noted contradictory statements regarding dissemination and longevity of teliospores and sporidia. In connection with this apparent confusion it is extremely important that all the personnel of this Division, who are rated as blister rust experts, should be more than casually familiar with the known facts regarding blister rust. The following quotations from U. S. D. A. Bulletin #957 by Perley Spaulding, Pathologist, should help to clear up any confusion:

"Distribution of the Teliospores

"Because the teliospores are produced in more or less compact columellae they are normally not separated from the host plant. They do become distributed somewhat, however. Gravatt and Marshall found that slugs eat telial columns from rusted Ribes leaves; also that sow bugs carry broken columns on their bodies. There seems to be no reason why insects and other animals may not do likewise.

"The telia are sometimes mechanically broken off and blown about by the wind.

"Diseased Ribes leaves fall to the ground and are blown about by the wind. Often they are broken into small pieces which may be blown long distances. In fact, York found such bits of dead leaves in his spore traps 200 feet distant from the nearest Ribes bush. Telia on dead leaves kept out of doors in the shade are known to retain viability for 65 days, so that in this way the disease might appear in very unexpected places on pines at a greater distance than the sporidia are carried in a viable condition.

"Longevity of the Teliospores

"York in 1918 found that teliospores were still capable of germination in tap water after being kept on the plucked leaves 65 days out of doors in the shade. A similar test of teliospores kept in the dark in the laboratory gave germination for 90 days.

"Distance of Dissemination of the Sporidia

"In work with spore traps by Pennington and Snell in 1918, sporidia were caught up to 60 feet from very heavily infected Ribes bushes. This was in the eastern Adirondacks, about 8 miles from Lake Champlain. Hundreds of pines were examined for infections. In no case was infection found on pines as far as 200 feet from Ribes plants. Pennington made a study of nine outbreaks in pines in the Adirondacks. The infection on pines was confined to an area within 100 to 200 feet of the Ribes plants which infected the pines.

"In 1919, Pennington caught sporidia up to 294 feet distant, but they failed to germinate. Under favorable conditions, sporidia caught at a distance of 177 feet germinated, but none beyond this distance.

"York, working in the White Mountain region of New Hampshire, in 1918, found that sporidia were quite common in spore traps exposed 24 hours at a distance of 200 feet from the diseased Ribes bush. York, in 1919 caught sporidia, under favorable conditions, at 600 feet distance, which germinated.

"Longevity of the Sporidia

"The sporidia of _Cronartium ribicola_ are so thin walled and fragile in character that it seems self-evident that they are short-lived spores. This supposition has been proved to be correct by the work of York and Overholts in the summer and autumn of 1918 and of York and Taylor in 1919. Colley found in 1917 that fresh sporidia germinated readily in distilled-water cultures. York, Overholts and Taylor dried the sporidia on glass slides and tested their viability after varying intervals. Very slight germination resulted after 10 minutes exposures by an open window at 66° F. when light rain was falling. None survived when exposed to bright sunlight for 10 minutes with a temperature of 77° F. Nor did they survive when pieces of Ribes leaves bearing the telia and sporidia were exposed to sunlight for 10 minutes at 85° F. and with a humidity of 30.5 per cent."

THE LATEST FROM CHEEKYE

H. N. Putnam

For the first time since October, 1930, Cheekye plot was visited and studied. These studies were made December 2 to 7 by a party of five men consisting of Messrs. Joy, Walters, Blomstrom, Nelson and Putnam. The work done was limited to the inspection of the white pines planted on the eight radii in 1926, and of four species of white pine, i.e. _Pinus lambertiana_, _P. monticola_, _P. flexilis_ and _P. strobus_ planted in October, 1930.

The weather conditions while we were at Cheekye were not particularly pleasant. It was rainy and disagreeable $2\frac{1}{2}$ days, very cold and disagreeable one day, and sunshiny and reasonably warm one-half day. In spite of the inclement weather no daylight time was lost and we even completed our work in one day less than scheduled time and were able to spend a day looking over infection and damage conditions at Daisy Lake. This speeding up of the work was largely due to the intelligent aid and industry of the three men from the eradication and California projects.

It will be recalled that Cheekye plot consists of a circular area having a radius of 1,250 feet. From this area of approximately 114 acres the Ribes have been eliminated as thoroughly as possible by repeated eradications. Healthy P. monticola planting stock was planted in 1926 on eight radii extending from the center to the circumference of the plot and for varying distances beyond it on noneradicated portions.

TABLE NO. 1
PER CENT OF PINES INFECTED, CHEEKYE PLOT, B. C.
IN 1930 AND IN 1932

On Or Off Plot	Distance in Chains: From Plot Center	From Circumference	October 1930: Number Pines Exam.	Number Pines Infected	Per Cent Pines Infected	December 1932: Number Pines Exam.	Number Pines Infected	Per Cent Pines Infected
On	0-4	16-19	626	91	14.5	624	331	53.0
On	5-9	11-15	749	109	14.6	747	418	56.0
On	10-14	6-10	748	124	16.6	745	413	55.4
On	15-19	0-5	685	104	15.2	677	329	48.6
Off	20-35	0	1,239	184	14.9	1,209	593	49.0
Tot.			4,047	612	15.1	4,002	2,084	52.1

In Table No. 1 it is shown that there was practically as much infection in 1930 and in 1932 at the plot center as off the plot where Ribes are present. Under conditions existing at Cheekye no protection of pines against blister rust was obtained by the removal of Ribes from an area of 114 acres. It is definite that the pine infection was due to Ribes more than 1,250 feet away.

In 1930 there were 612 white pines infected, of which 97 or 15.8% had been killed by blister rust. In 1932, of these same infected pines, 285, or 46.6%, were killed by blister rust.

In 1932 eight pines which showed no infection in 1930 had been killed by blister rust, bringing the total pines killed by blister rust to 293, or 14.1% of the pines infected in 1932 were dead that same year. This percentage is close to the 15.8% of infected pines killed by blister rust in 1930 and suggests a fairly constant relationship between infected trees and killed trees in a uniform size class in a given year.

A point of interest was the finding of several cankers well covered with Tuberculina maxima, (the lilac fungus parasitic on aecia). In two instances this parasite had thoroughly covered the aecia and had grown over the pycnial portions at either end of the cankers.

Another interesting observation was the appearance on the 9-year old planted trees of several two-year old cones which had already shed their seed. One-year old cones were also observed in quite large numbers.

In October 1930 four species of white pines, i.e. 995 P. lambertiana, 1,000 P. monticola, 979 P. flexilis and 985 P. strobus were planted in 28 plots, each plot consisting of equal numbers of each of the four species. Twenty of these plots were at definite distances from the center of each radius and 8 were outside of the Cheekye Plot proper.

The purpose of this study was to determine the relative susceptibility of these four species of white pines at varying distances from infected Ribes. Incidentally, this constitutes an excellent opportunity to study the survival of these four species.

Since these planted white pines have been exposed to blister rust only during 1931 and 1932, few cankers had developed and no indications of differences in susceptibility were apparent. The four white pine species were infected by blister rust as follows: P. lambertiana, 1.8%; P. monticola, 2.7%; P. flexilis, 1.9%; and P. strobus, 2.1%.

Since these trees were planted in October, 1930 the oldest infections must necessarily have originated in 1931. Analysis of the 56 cankers found shows the majority of them on 1930 growth with a few on 1931 and 1929 growths.

A striking difference in the survival of these four pine species was apparent. The per cent survivals were as follows: P. lambertiana, 16.6%; P. monticola, 69.8%; P. flexilis, 83.9%; and P. strobus 86.4%. The poor survival of P. lambertiana may be due in part to the fact that it was 2-2 years old while the planting stock of the other three species was 2-1.

It was most interesting to again take data on Cheekye plot after an absence of two years. It is believed that if this plot is gone over every two years information of value will be obtained relative to the action of blister rust on the Coast, the rate of damage, relative susceptibility of the four pine species studied, and the growth and development of Tuberculina maxima under natural conditions.

RESUMÉ OF THE JANUARY 18 PERSONNEL MEETING

W. G. Guernsey

The monthly personnel meetings are bringing active participation by all blister rust members present in Spokane. There were two general topics discussed at the last meeting. Development in Ribes eradication methods, and second, our faithful debate subject - checking.

Developments in Ribes eradication methods were first brought to our attention. Frank Walters explained that the eradication forms used last season were simplified by using one form for daily entries. He further explained that it is best to arrange an orderly method of working camp units and post a large scale map showing progress of crew work. It is a good plan to

systematically strip any area thought free of Ribes before definitely deciding not to work the area.

Neal Nelson discussed the general use of a form of Ribes tool on each job. The trench pick has the most general use, with the Pulaski, Anderson Special and California tool used in special cases, as in rocky formations, burned over or brushy areas. Nelson suggested the use of pliers on small roots and crowns.

J. F. Breakey explained the tractor Ribes eradication method. There are two general plans for handling brush by the bulldozer: piling the brush at random and piling it in carefully planned windrows. The random method necessitates special care in burning and construction of fire trails; the planned windrow method assures protection to surrounding timber and the locating of brush in dry spots to assure easy burning. There are several improvements that must be made to the tractor which include a mechanical shaker for jarring surplus dirt from roots and swamp type tracks which will increase moving power in swampy areas.

H. E. Swanson discussed the developments in chemical eradication methods. It was pointed out that through the standardization of knapsack spraying on all eradication projects and the use of a 10% chemical concentration with a more complete coverage of Ribes, better results were obtained. The scope of knapsack and power methods was discussed and a description was given of the two power set-ups for selective and broadcast spraying. In the use of $NaClO_3$ for the treatment of Ribes inerme two facts are apparent:

1. With the methods now used, treatment of all parts of the plant by soil drench and aerial spray is most effective.

2. In order to obtain satisfactory results, a second treatment of an area is necessary. The chief problem now is what are the most economical and effective combinations of chemical and water used for first and second treatments.

C. C. Strong summarized the general discussion on eradication methods. He also stated that there are many important parts of eradication methods work that are carried on in the various going field operations.

E. L. Joy gave a brief outline of the checking organization and methods used in 1932. Joy will give a more detailed explanation of the work in a later issue of the Blister Rust News Letter. Joy stated that the purpose of checking is to ascertain the quantity of Ribes left per acre after Ribes eradication which in turn indicates the degree of protection afforded stands of white pine. In 1932 the checking organization covered the work of forty-one Ribes eradication camps. The method was a two per cent strip system of check on the hill types and a four per cent check in stream type. There were several study areas covered with a greater per cent of check that will give some valuable information when the data are summarized.

C. M. Chapman discussed the general field procedure of the checking organization during the 1932 field season. Chapman will give a more detailed explanation of his work in a later issue.

W. G. Guernsey read a report on "Cooperation in Ribes Eradication Checking", outlining the combined opinions of Hartman, Nelson and Guernsey. The following are several items taken from the report: A check of Ribes eradication is a necessary practical part of our work. A check of this work insures careful crew work, intelligent and continuous effort on the part of the camp bosses and unit supervisors. It gives an added peace of mind to the men handling the job with the conviction on the part of our cooperators that we are actually protecting their white pine.

While checking has contributed a large part to our properly cleaning areas of Ribes it is possible to further organize the personnel and the method of checking to obtain more practical results. One of the main points that will be of assistance in this respect is having a permanent man give his full time to the supervision of checking work.

COMPENSATION CASES

R. L. MacLeod

Most of our personnel are familiar with the various compensation forms. A good deal of time and trouble, however, can be saved all along the line if the field supervisors will take note of the following points:

1. The Request for Treatment should be sent to the designated physician with the employee. Use form CA 16 if the employee was definitely injured in the performance of his regular duties. Form CA 17 should be used when the employee has not been actually injured on the job. For cases involving cedar poisoning, poison oak, mental instability, sickness in camp or for any other case in which there is doubt as to compensability, use form CA 17.

2. Form CA 2, CA 3 and CA 4 should agree in details common to any two forms. The fact that information given on one form does not check with information given on another has caused a good deal of extra time and trouble both for our field and office personnel. This difficulty can be obviated by providing each project leader or supervisor with a form showing all pertinent data concerning each compensation case which can be kept on file in the camp for use in completing each compensation form. Such a form is being made up and will be supplied to the field men during the field season of 1933.

3. Form CA 1 and CA 2 should be forwarded to the Spokane office as soon as possible after the employee is injured. Form CA 3 and CA 4 should be forwarded on the termination of disability. Form CA 4 is a claim by the employee for personal expenses involved in securing medical attention and should be accompanied by itemized receipts covering these expenditures. When it is necessary for an employee to use his personally-owned car the mileage rate of \$.05 per mile is not allowed. He will be allowed gas and oil expenses provided that receipts are submitted.

4. Form CA 3 requires information concerning dates on which subsistence was not furnished and form CA 4 requires information concerning dates on which subsistence was furnished. This refers to subsistence furnished in a Government subsisted camp and in answering these questions any subsistence furnished in a hospital should be disregarded.

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March, 1933

WESTERN BLISTER RUST

NEWS LETTER

* * *

Confidential

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

A CHEMICAL INVESTIGATOR PROTESTS

H. R. Offord

A chemical investigator (for the benefit of late tuners-in his name is Offord) protests against the novel figures of $408 and $680 per acre recently presented by Swanson as the cost of chemical needed for the eradication of R. inerme by the scheme outlined in the January issue of the News Letter. The purpose of this brief note is merely to call attention to a misinterpretation of certain basic data so that further discussion of the topic by other project leaders may not be colored by a similar error.

Briefly, objection is made on the grounds that in my original article data were not given whereby eradication costs per acre of stream type could have been computed. In attempting to determine cost of chemical per acre of stream type, apparently Swanson selected figures for the rate of application on the acre basis given as 4,800 and 8,000 pounds, instead of the estimated equivalent of 350 and 583 pounds per acre, for ground covered. Using these latter figures, it is possible to make a rough approximation of the minimum quantity of chemical needed per acre of ground covered (not ground actually treated) according to the general scheme advanced by the writer. At the very best, however, these quantities are but rough estimates because the field method has not been tried. With due respect to Swanson's statement that approximately 25 per cent of an area is covered in the present method of selective application, it can be said that no well established data are extant showing the actual density of R. inerme under various stream type conditions. The chief point presented by the original paper concerned the excellent chance of a substantial reduction of such quantities of chemical (i.e. the quantity of chemical now being used) by the simple expedients of the removal of small scattered bushes and the preliminary grooming of clumps of R. inerme.

Possibly a mistake may have been made in the past by using an acre as the unit for expressing dosage rather than a square rod or square yard. The original article, therefore, might have been less confusing to the eradicator (who is accustomed to thinking of acres as acres covered by his crew and purged of Ribes) had the rate of application figures of 4,800 and 8,000 pounds per acre been omitted, and the dosage figures of 30 and 50 pounds per square rod for ground actually treated been set up alongside the equivalent figures of 350 and 583 pounds per acre for ground covered. The dosage figure of 30 pounds per square rod represents a quantity of chemical very close to that which Swanson used in the 1931 power job on the Orogrande Creek; excellent results were reported on this bit of work for both cost and efficiency.

May we have some further discussion of this fascinating subject by Hiram Johnson, the godfather of mechanical operations, and some reputable and Simon-pure eradicator.

Another point in Swanson's article merits attention because it has a direct bearing on present and future work of this project. He stated that "this method has killed R. inerme regardless of depth of roots". Now, while the information that Quick has obtained by his preliminary and all too brief

root studies does not prove that the depth of roots is the sole explanation for inconsistent kills, considerable data do indicate that depth, manner of distribution, quantity of underground plant parts capable of regeneration, and the degree of protection afforded those parts by the soil character are contributive factors in the resistance of any Ribes species to chemical treatment. If the relationship between the gross morphology of roots and effectiveness of chemicals has already been established, the writer would be glad to receive a summary of the field data in order that a rather expensive and tedious job may be deleted from the calendar of his project's activities.

A NEW POINT OF ATTACK FOR BIOLOGICAL CONTROL

Royale K. Pierson

During the past year, two articles on biological control have appeared in the News Letter, indicating that this type of control is receiving some attention by those interested in blister rust. One of these, by Quick, suggests a caterpillar with an unusual appetite for Ribes leaves. In the other, Goodding lists the several species of fungi, some parasitic and some secondary, which prefer the blister rust mycelium and spores or the resulting canker tissue as their source of nutrition. Why confine our speculations to Ribes leaves or cankers alone? Why not examine the entire life history of the Ribes plant for a vulnerable spot and then search for an enemy of it? Surely, somewhere in the world there is an organism, plant or animal, which should prove epidemic on the Ribes leaves, buds, canes, roots, flowers, fruit or seeds.

In the same way, the life cycle of the rust with its many spore forms divided between two hosts should offer several points of attack. For some time the writer's attentions have been centered on the pycnial stage and it is his belief that this stage is one of the weakest links in the life cycle presenting some of the best opportunities for biological control. This is based on accumulating evidence that pycniospores are directly responsible for the development of the aecial stage whose eruptions in the pine bark cause a drying out of the cambial tissues beneath and subsequent death of the infected parts. That pycniospores are functional will soon be an established fact. Each year adds several more species of plant rust to the number already known to have functional pycnia and blister rust is no exception.

While working on the pycnial stage of the blister rust, the writer has assumed that the pycniospores are functional and now experimentation bears every indication that this assumption is correct. From the start, one of the main facts leading to this assumption is the constancy of behavior displayed by all rusts of a given sequence of spore forms. What seems to hold good for one species holds good for a large number of related species. This has been demonstrated again and again. The main object sought, therefore, is to discover the exact mechanism of this function in order that a loophole for control might be found.

Thin sections, under the microscope, of material fixed two days after an interchange of pycniospores between pycnia borne by two different infections revealed pycniospores fusing with hyphae protruding beyond the common level reached by the pycniosporophores. It is not improbable that these hyphae are receptive or trichogenous hyphae since there are no other openings to the exterior in the pine stem such as we have in leaves. A similar

condition exists in the wheat rust where the pycnium on the barberry leaf serves as a means of entry for fertilizing spores from another infection. Actual photographs of pycniospores fusing with receptive hyphae that can be traced back to the aecial primordium of the sunflower rust have recently been made by A. H. R. Buller of Canada.

The pycniospores of blister rust are minute, pyriform, bodies, scarcely larger than an average size bacterium. A thin wall encloses an immense nucleus surrounded by a thin film of cytoplasm, containing practically no reserve food. In order to remain alive for any length of time, it is necessary for the pycniospore to be suspended in some nutrient solution such as the pycnial fluid or nectar which contains appreciable amounts of reducing sugars and other soluble foods. Due to the presence of such sugars, the nectar with the spores falls prey to many fungi and to insects that are attracted by the nectarious odors given off.

One needs only to make a hanging drop culture of the pycnial fluid to exhibit the numerous fungal spores harbored therein. An examination after several days incubation will show that native yeasts have almost displaced the pycniospores. In another few days, the drop has become clouded with dense mycelium and spores of a variety of molds. One might ask, to what is the rapid spread of the rust held accountable if the pycniospores are so beset with enemies? As in the case of all male spores, nature has provided for these inroads by producing such spores in enormous quantities, thus increasing the chance for survival. Although in nature, no single enemy or pest may seem spectacular in halting the development of the pycniospores, at this time we can only speculate as to what may be the outcome if the pest in question is given scientific encouragement. Each may contribute in a small and inconspicuous way but the sum total may result in an appreciable amount of control.

Biological control is nature's own way of holding all things in a natural equilibrium and preventing any one form of life from gaining the upper hand. Truly, there are fluctuations and departures from this static condition; for example, our native mountain pine beetle. Human activity is the largest single cause of a disturbance in this great natural balance and we must do what we can to restore conditions to their original state.

Perhaps we should examine our indigenous coniferous rusts such as the gall forming rusts, the pinyon rust and others, for hints on biological control. These rusts,in spite of a large number of both hosts growing in close association, never seem to reach epidemic proportions except in very localized areas. What then, prevents them from exterminating their native coniferous hosts? Surely, from the standpoint of time, they have had ample opportunity to do so.

It has been suggested that a resistant pine be substituted for our native white pines as a means of overcoming the ravages of the rust. As long as the rust exists, it will give rise to mutations resulting in hybrids due to the interchange of pycniospores. While these mutations and hybrids may die as soon as they arise, it is also possible that they will find a compatible host in some new resistant variety of white pine. We should therefore content ourselves with the presence of the rust in our present stands of white pine, but have its development and spread so hampered by parasites and Ribes eradication, that it will be financially possible to continue growing this most useful wood.

A PREDICTION OF BLISTER RUST DAMAGE

H. N. Putnam

In April, 1926, 4,965 healthy western white pines were planted on the Cheekye plot. During the autumns of 1927, 1928, 1929, 1930 and 1932 inspections were made of these planted pines to determine the number infected, the number dead from blister rust, and the number dead from other causes. This period of 7 years during which the pines have been exposed to blister rust is sufficiently long to give us certain trends in infection and damage by blister rust.

From the data taken in these years three curves were constructed based on the number of pines infected, number killed by blister rust, and number dead from other causes at the time of each examination. These curves were then projected in the directions indicated.

Table No. 1, which is based on these curves, shows actual data for the period 1927-1932 and predicted data thereafter.

TABLE NO. 1

PREDICTION OF BLISTER RUST DAMAGE TO 4,965 WESTERN WHITE PINES PLANTED AT CHEEKYE, IN APRIL, 1926

Data Actual or Predicted	Date	Pines Alive			Pines Dead From		
		Healthy	Infected	Total	Blister Rust	Other Causes	All Causes
Actual	Oct. 1927	4,106	38	4,144	0	821	821
Do	Oct. 1928	3,876	243	4,119	0	846	846
Do	Oct. 1929	3,726	286	4,012	42	911	953
Do	Oct. 1930	3,435	515	3,950	97	918	1,015
Do	Dec. 1932	1,918	1,791	3,709	293	963	1,256
Predicted	Jan. 1934	805	2,670	3,475	500	990	1,490
Do	Jan. 1935	60	3,150	3,210	750	1,005	1,755
Do	Jan. 1936	0	2,870	2,870	1,080	1,015	2,095
Do	Jan. 1937	0	2,420	2,420	1,520	1,025	2,545
Do	Jan. 1938	0	1,830	1,830	2,100	1,035	3,135
Do	Jan. 1939	0	1,170	1,170	2,750	1,045	3,795
Do	Jan. 1940	0	330	330	3,580	1,055	4,635
Do	Jan. 1941	0	0	0	3,900	1,065	4,965

According to the table all of the surviving pines will have become infected by January, 1936, approximately 10 years after they were planted and exposed to blister rust. By January, 1941, 15 years after planting, every pine will have succumbed either to blister rust or other agencies.

The primary causes of death other than blister rust have been such factors as poor planting sites, shading out by other plant growth, drouth, disturbances by man, chewing by rodents, etc. The rate of death from these agencies was highest during the first 1-1/2 years after planting and greatly retarded thereafter. Only 142 pines were found dead from causes other than blister rust from October, 1927 to December, 1932, in contrast to the 821 pines which died during the first 1-1/2 years.

According to the predictions all of the pines alive in January, 1936, will be infected. Assuming that the past rate of death from other causes is indicative, 50 of these infected pines will die from causes other than blister rust during the period January, 1936, to January, 1941.

The average height of 85 pines in the first five chains on the north radius was computed for each of the inspection dates. These data were plotted and the resulting curve extended. This curve indicates that the average height of these planted pines will be 3.7 feet in January, 1936, when all the trees will be infected. By January, 1940, the average height of the last surviving pines will be 6.5 feet.

In making these predictions it is, of course, realized that very probably a small number of pines by virtue of screening, inherent resistance to the rust, or some other cause will not have become infected by January, 1936, nor killed by January, 1941. However, the number of such individuals must necessarily be so small as to be negligible.

In October, 1927, 38 pines were found infected and in October, 1929, 2 years later, 42 pines were dead from blister rust. Again in October, 1928, 243 pines were infected and in December, 1932, four years later, 293 pines were dead from blister rust. This indicates that as the pines become larger the time between infection and death increases.

Whether or not these predictions are accurate is relatively unimportant. It is obvious that white pines planted under conditions existing at Cheekye cannot possibly survive to the age of commercial value or of even aesthetic value. The data indicate that death from blister rust follows within a few years the infection of white pine planting stock exposed to blister rust from the time of planting. There is emphasized the futility of planting white pines in an infected region unless Ribes bushes within infecting distances have been removed.

It will be interesting to check on the accuracy of these predictions by making future examinations of the Cheekye plot.

CROWN AND ROOT STUDY OF RIBES ROEZLI

F. A. Patty

In 1929 the tops of 56 *Ribes roezli* bushes were removed, half of the crowns were left exposed and the other half was covered with four inches of soil. The crowns that survived the following year, 1930, produced much new growth and two years later (1931) some of the new shoots were fruiting lightly. In the third year, 1932, only 10 of the old bushes were alive and they had very little live stem.

Ribes bushes are pruned quite heavily in nurseries and commercial plantings to produce new woody growth. Why should so many of these plants die after the tops were removed, especially after they had produced new growth for two years? Perhaps this is one of those studies that gives results which can never be repeated. A check of two plots similar to this one will tell more definitely whether or not *R. roezli* can be killed by removing the tops. If these data are substantiated, additional information to determine the cause of death would be of value to the Ribes eradication work.

Treatment Applied	Original Number of Bushes	Total Feet Live Stem Removed	No. Bushes Surviving In			Number Feet Live Stem Found In		
			1930	1931	1932	1930	1931	1932
A	28	2,085	16	16	4	267	302	5
B	28	1,460	20	18	6	372	309	12
Totals	56	3,545	36	34	10	639	611	17

A - Aerial portion cut off, crown exposed.
B - Aerial portion cut off, crown covered by 4" of soil.

SIZE OF RIBES ERADICATION CREWS

L. L. White

The size of Ribes eradication crews has always been a problem of importance to the eradication forces and it has been difficult to determine the size of crew that will be most economical and whose efficiency will be high. The size of crews is important in that it has a bearing on the per acre cost of eradication.

During the field season of 1928 Swanson carried on studies relative to the size of crew. The detailed results of this work can be found in the May, 1932 issue of the Western Blister Rust News Letter. Crews having from one to six men were used on one block which had a uniform Ribes distribution. The efficiency of these crews varied from 84% to 87%. The 6-man crew showed the highest efficiency and the 1-man crew was the least efficient. This variation in efficiency is too slight to be a factor of importance. From the standpoint of production the output was inversely proportional to the size of crew, varying from .5 man days per acre in the case of the one-man crew to 1.3 for the 6-man crew. An analysis of all regular eradication work performed from 1927 to 1930 shows the same relation between output of work and size of crew.

At the beginning of the 1932 field season, Anderson and the writer decided to experiment with 1 and 2-man crews at Headquarters, Idaho. They split a 25-man camp (Camp W) into six 1-man crews and eight 2-man crews. One man was put in charge of the 1-man crews, his entire time being spent with these crews in laying out blocks and checking on the men and the work. These crews were placed on a large area of fairly heavy Ribes concentration. Each man was given a block six chains wide that extended from the stream up to the ridge top at right angles to the stream. One block bordered another and so on along down the stream so that all six men were never at one time a great distance apart. This arrangement made it possible for the foreman to check on the crews with little difficulty. Each 1-man crew worked a strip approximately one chain in width, the boundary of his first strip being the string line which indicated the block boundary. He laid his own string line and worked back and forth from one side of the strip to the other. On all strips after the first, he worked between his own string lines. At first it was thought that a 1-man crew could work a strip two chains in width, but it was found that due to brush density, reproduction and small ridges, the crewman could not see at all times from one strip boundary to the other.

Advantages of the 1-man crew are: There is no conversation to distract the crewman's thoughts from his work. The crewman does not have

to wait for other crewmen who might be temporarily delayed by a clump of Ribes. There is no overlapping of strips and a minimum amount of string line is laid. The crewman is alone responsible for the speed and efficiency on his own block, and therefore the foreman can check on each individual crewman.

<u>Disadvantages of the 1-man crew are</u>: An inexperienced man must work with other men and be trained in Ribes detection before he can work by himself. The lack of companionship of other crewmen tends to make the work monotonous and the crewman becomes weary and tires more easily. After many days of this work some of the men become quite careless. Some of the less experienced and younger men become slightly frightened and ill at ease at times. This last point perhaps seems a little far-fetched, but it is nevertheless a factor in lowering efficicncy.

The success of the 1-man crew system depends largely on supervision. A camp boss of exceptional ability should be selected to direct the 1-man crews. The crews should be watched closely and carefully checked. Good planning in laying out blocks and the placing of men is required by the camp boss to make supervision most effective. The adaptability of the 1-man crew is undoubtedly limited but under suitable working conditions, this size of crew should prove of great value.

The 2-man crews were placed on areas of lighter Ribes concentration but which required 100% eradication. These crews were supervised by the camp boss personally. Each crew was given a block that bordered the stream for one-half mile and extended back to the ridge top. The strip worked was from one to two chains wide. It was worked at right angles to the stream so that a portion of the unworked area would be always near the stream to prevent excessive walking of the crew in going to work.

The 2-man crews do not require quite as close supervision as do the 1-man crews. In light concentrations there is very little waiting on the other man and little overlapping of the strip worked. The conversation between two men is not sufficient to have a noticeable effect on the work.

It was found that the Ribes efficiency of the one and two-man crews in Camp W was practically the same.

1, 2 and 3-man crews were used in several instances on the Clearwater National Forest with results comparable to those of Camp W. The 1-man crews were put to work on one block, each man's strip bordering on the strip of a man ahead. A very speedy and efficient man was given the first strip and he served as the pace setter. The other men were started after him and were expected to keep up. By the use of this system each man had to do his share of the work or drop behind. Also, there was a certain amount of sociability as the men ate lunch together and went to and from work together. This system afforded very close supervision. The Ribes efficiency of the 2 and 3-man crews was higher than that of the 1-man crew on this job. These conclusions are made entirely from observation.

As a result of the observations on 1, 2 and 3-man crews during the past field season, we conclude that 1-man crews should be used on areas of heavy Ribes concentration whether upland or stream type; that 2-man crews

should be used on areas of from heavy to medium Ribes concentration; that 3-man crews should be used on areas of medium to light Ribes concentration; and that no crews with more than three men be used.

During the next field season it is advisable that a number of camps experiment further with one and two-man crews. We shall then have sufficient data available with which to construct reliable curves to be used on a comparable basis with those constructed by Swanson in 1932, from the 1928 data.

PERSONNEL MEETINGS

F. O. Walters

The personnel meeting of February 15 was devoted largely to subjects dealing with biological control.

L. N. Goodding sent in a paper entitled "Biological Control", in which he raised the possibility of Ribes suppression by biological means and reviewed some of the organisms which affect the blister rust cankers. *Tuberculina maxima* is the most widely known of the organisms attacking the cankers and has probably overshadowed other worthy organisms. Other organisms which may have possibilities were reviewed. *Dasycypha agassizii* is abundant at Revelstoke and Rhododendron and doubtless greatly reduces aecial production. Another Dasycypha was found on Mt. Hebo, Oregon which attacks very young cankers and probably reduced aecial production 75 per cent. At Rhododendron two Nectrias and two Fusaria were obtained. These organisms are quite active on blister rust cankers but appear to be of rare occurrence. A Phomopsis at Rhododendron appears very active on cankers of all ages. A Fusarium from Arizona transferred to cankers at Rhododendron seems promising.

Frank Walters gave a paper on the possibilities of Ribes suppression by biological means. The paper was divided into three parts, discussing the possibilities of Ribes reduction by: (1) attacks by fungous diseases. Some of the principal organisms parasitizing Ribes were discussed in relation to their effect on the host. (2) Browsing by sheep and goats. Particular attention was given to the desirability of goats as an agency for the reduction of the Ribes population. (3) Insects. Attention was given to the destructiveness of some of the leading insects preying on Ribes.

In his paper, Ed Joy described methods of canker analysis and gave a resumé of effectiveness of disease and Ribes control studies. The Ribes studies show that although the original concentrations of 10 to 100 thousand feet of live stem per acre are reduced to only a small percentage of this original amount by the initial eradication, regeneration and growth during the two succeeding years totals as much as 12 times the original amount left. These studies also show that in most cases reeradication has not resulted in the desired reduction of live stem. Studies were made of 6 pine infection centers originating previous to 1929, 3 of which were adjacent to stream type areas worked in 1929 and 3 on unworked areas. Adjacent to the areas worked no cankers formed since eradication were found but on the unworked areas the number originating since 1929 varied from 67 to 97 per cent of the total. It was pointed out that although these studies were not sufficiently thorough to give conclusive evidence of the total absence of cankers formed since eradication, they were intensive enough to indicate that stream type Ribes eradication has prevented the usual rapid canker increase.

"The Biological Control of Blister Rust on White Pine" was the title of Doctor Hubert's paper. His list of agencies which may be effective on the pine cankers include rust parasites, secondary fungi, insects, rodents and snails and slugs. The rodents and fungi seem the most effective means of canker suppression. Tuberculina maxima seems at present to be the most important rust parasite and has been known for many years in Europe. The first occurrence of T. maxima in this country was noted in 1917 on the native pine rusts in Montana. The fungus is an obligate parasite and no suitable artificial media has been discovered upon which it will develop. Twelve inoculations were made on cankers at Cameron Creek with material received from Germany. When inspected the following spring, the six specimens which were collected were dead. Since a few of the uninoculated cankers also died during this period, no reliance could be placed on the results. Nothing is known of the overwintering phase of the organism.

Forest practices received special attention at the personnel meeting of March 1.

Frank Patty discussed the California ecology program and the results of some of the work. Studies on the influence of logging practices in the establishment of Ribes show that when duff disturbances are reduced to a minimum, Ribes seed germination is correspondingly reduced. In the upland types restocking by Ribes begins the second year after the timber is cut, in the stream type it begins the first year. Restocking will continue on a logged over area for at least 12 years, altho it materially decreases after the third or fourth year. The removal of Ribes twice before logging did not prevent the reestablishment of a considerable Ribes population. Storage studies show that viable Ribes seeds occur in the top, middle and bottom layers of duff and the seeds will work their way downward through the layers of soil.

W. G. Guernsey discussed planting methods as practiced by the Forest Service. The nursery should be within the region in which the trees are to be planted. One desirable feature of a nursery site is a light sandy loam soil which is well drained. An abundant water supply is also necessary. The seedlings must be protected against disease, frost, sun scorch, insects and rodents. 4,000 young trees are packed in a bale and shipped to the planting site. White pine is usually planted on the north-facing slopes, yellow pine on the southern exposures and Engelmann spruce is often planted along the streams. The planting crews are similar to an eradication crew working in line and following a pace setter. Their work is closely inspected by a foreman. Planting is done in the spring and fall.

B. A. Anderson's talk dealt with sustained yield forest management - the forester's Utopia; a panacea for the ills which beset the forest industries. A forest is on a sustained yield basis if it is so managed that the forest crop is harvested at a sufficiently moderate annual rate to permit new growth to replace what is cut, thus giving a permanent regular output of forest products. This type of forest management insures:

1. Stabilized local communities.
2. A permanent timber supply.
3. Permanent forest industries.

No system of forest management can be successfully practiced in the white pine forests without making adequate provision for the protection of the stands from white pine blister rust.

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WESTERN BLISTER RUST

NEWS LETTER

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

CHEMICAL ERADICATION AGAIN

H. E. Swanson

In the last four issues of the News Letter the subject of the eradication of R. inerme by use of chemicals has been discussed. In the March issue Offord took exception to the interpretation of his data, but the writer wishes to state that he was entirely clear on the distinction between area actually treated with chemical and area looked over for Ribes but only partially treated with chemicals. The writer had in mind the first interpretation of area in his use of Offord's data on page 7 of the January News Letter which recommends 4,800 pounds and 8,000 pounds of chemical per acre. A review of the article in the February issue will show that each reference to area and method of applying chemical was accompanied by qualifications showing the basis on which the term "acre" was used, whether it referred to ground actually covered, or as in the case of a large scale operation, to the entire area looked over for Ribes. The chemical eradication project is not at a total loss in making estimates upon the per cent of area actually covered by Ribes and treated with chemical. Data on this point can be found in the 1928 Annual Report.

As a protest was made against the "novel" cost figures derived from the recommendations of the chemical investigators, further discussion on this point may show what the writer endeavored to set forth in the February issue. If an acre of stream type is covered entirely with R. inerme and every square inch of the area must be treated in order to kill the Ribes, Offord has recommended that chemical be applied at the rate of 4,800 pounds (30 lbs. per square rod) per acre on sand-bar type (including drained swamp type) and 8,000 pounds (50 lbs. per square rod) per acre on bench type. These amounts of chemical as laid down on the job at 1932 prices would cost $408 and $680 per acre. Whatever the size of the area actually treated, whether it is a square yard or a square rod, the proportional costs are at these same rates. To illustrate what these costs mean, a man can be fed and paid for 8 hours of labor at an approximate cost of $3.50 per day. With $408, he could be paid for 112 days of work and provided with axe, shovel and pick; and with $680 he could be similarly equipped and paid for 192 days of work. With the average working season of 55 days, a man could spend two seasons in the first case and more than 3 seasons in the second case on an acre of ground. It is true that in actual practice the parts of this mythical acre would be scattered around over a larger area but this does not influence the comparison. Attention is called to the fact that no costs for applying chemical have been included in the above costs.

Explaining his position further, the writer is not aware of any case on the 1931 power spraying job on the Orogrande where 30 pounds of chemical were applied per square rod. The data for this work show that an average of 6 pounds of Atlacide were applied per square rod. This is on the basis of area actually treated with chemical. While the Ribes area was treated 100 per cent with the first application, it was possible on the respray to be more selective and to apply the chemical at vulnerable spots. The benefits of two applications of chemical in securing a more complete kill on R. inerme are quite apparent.

It is the plan of the chemical eradication unit to continue experimentation involving two treatments with sodium chlorate in amounts not to exceed 6 to 12 pounds per square rod for the combined treatments, and to coordinate the first and second applications for the most economical use of chemical. Excellent results were appearing on several plots treated with these amounts in 1932. These applications are presented in contrast to the 30 and 50-pound treatments recommended by the chemical investigation unit. Apparently the eradicator has more hope for the successful use of sodium chlorate in the R. inerme problem.

In regard to the combination of hand pulling and chemical methods, the scattered individual bushes are not the problem. These can be found and taken out. The actual problem is the complete suppression of the heavy concentrations of R. inerme at a reasonable cost. Chemicals should be used to the extent that a sufficient amount of the Ribes roots and stems are destroyed to permit a clean-up job by hand pulling methods. The R. inerme which survives chemical treatment is generally in such an injured condition that it can be easily pulled.

In this article the writer trusts he has made himself clear. In his position as an eradicator, concerned with both costs and efficiency, he is not in accord with recommendations to apply chemicals in the amounts suggested by the chemical investigation unit.

The writer made the statement in the February issue of the News Letter that a method involving two applications of sodium chlorate has killed R. inerme regardless of depth of roots. It can hardly be implied from this, as the chemical investigator has done, that the writer might have information establishing the relationship between the gross morphology of Ribes roots and the effectiveness of chemical. R. inerme has been killed regardless of depth of roots and at no time has the writer stated that chemical has killed R. inerme in all cases. Chemical treatments have failed to kill R. inerme bushes with either deep or shallow roots. The chemical investigative unit should know that a knowledge of one variable will not explain the success or failure of chemical treatment on all areas. Under no circumstances does the writer wish to be considered as standing in the way of any scientific investigation. He is in full accord with the work being done on the comparison of the gross morphology of roots and effectiveness of chemicals. As the subject is brought up and apparently the chemical investigative unit is open to suggestion, an invitation is extended for them to move their experiments from Blewett Pass in Washington to the Coeur d'Alene or Clearwater Forests in Idaho. If the gross morphology of roots should vary on areas so remote from each other, it is possible that more uniform results and probably more reliable information on the use of chemicals especially on these two national forests will be forthcoming.

The writer is signing off on this discussion until next fall, when he hopes to have more data on the subject.

May we have an expression of opinion from other project leaders as to how far we can go in the use of chemical for suppressing R. inerme and also on the other points that have been presented in the course of this discussion?

CHEMICAL ERADICATION WARFARE AS SEEN BY A COUPLE OF ERADICATION NEOPHYTES

F. O. Walters, N. D. Nelson

There seems to be a considerable lack of sympathy between two very important projects, namely, the chemical investigation and eradication projects. This may be a healthy situation, as the natural rivalry created by the situation may lead to increased effort to filter out needed facts. On the other hand, does this sort of rivalry build up an inhibition against the acceptance by the rivals of certain valuable leads that may be turned up by one or the other project? The attitude assumed by the chemical forces is that the eradication men are a rather ignorant lot and lack any training by which they may properly interpret findings they may be lucky enough to uncover. The eradication forces feel that the chemical men have their heads in the clouds, that their work is of an ultra-scientific nature and not applicable to practical eradication work. Somewhere there is a happy medium--the sooner these two projects can get their heads together and assume an attitude of mutual understanding, the sooner tangible results will be produced.

ERADICATION OF RIBES BY A COMBINATION OF MECHANICAL, CHEMICAL AND HAND PULLING METHODS

C. H. Johnson

Judging from the suggestions and comments that have appeared on the subject of eradication of *Ribes inerme*, it can be inferred that we are progressing and eventually the high cost of stream type eradication will be materially reduced.

According to opinions thus far expressed, no single method is sufficient by itself and several unseasoned methods have possibilities. The writer views favorably the trend towards the merging of methods with the hope that effective combinations will be developed.

If a combination of hand pulling and spraying *R. inerme* is not practicable, there exists the possibility that mechanical equipment may prove a worthy substitute for the chemical spray on at least some of our most troublesome areas. Chemical sprays will continue to deal destruction to *R. petiolare* and later *R. inerme* may be subject to attack, but spraying is a "fair weather method"; therefore it is not unreasonable to assume that a limited amount of hand pulling of both *R. inerme* and *R. petiolare* can be conducted in conjunction with eradication by mechanical methods. This must occur as mechanical equipment is improved and the work season is prolonged.

There is no basis for making comparative costs of stream type eradication by the various methods, because as yet we have developed no one method capable of dealing decisively and simultaneously with Ribes as they commonly occur over expansive areas. We are still advocating the application of a single method to be followed by another application or a second method. The solution is once over the ground. We have developed methods and know their limitations. Hand pulling costs are both moderate and prohibitive. Spraying costs may be considered low, but if complete drenching must be resorted to,

that method no longer holds any attraction. Eradication with mechanical equipment is the cheapest and most effective method being developed for the treatment of concentrated masses of mixed Ribes intermingled with brush. That method likewise becomes expensive so soon as we stress agricultural possibilities and proceed to use that equipment at the outer edges of the stream type where windfalls and trees are numerous and Ribes comparatively light.

Stream type areas similar to those found near Clarkia, Honeysuckle and Haugan should be worked by a combination of hand pulling, spraying and mechanical clearing without delay.

The pooling of opinions is desirable even though it is possible through no other medium than the News Letter. With the objective of more correlation between working methods, organization and procedure is suggested for dealing simultaneously with tangled masses of brush and Ribes.

A well balanced crew might consist of machine operator, two swampers and three eradicators experienced in hand pulling and spraying; the two swampers to be charged with draining ground, cutting logs and proper disposition of brush. A man designated as head swamper would be the key man or foreman, but above all a practical woodsman capable of sizing up a situation and deciding quickly where a machine could best be employed. Spraying and hand pulling should not occupy his attention. That unit would function similarly to our organized 3-man crews with a veteran eradicator in charge.

Common sense would dictate the proper procedure. For reasons obvious a certain amount of hand pulling and spraying could be more advantageously conducted in the wake of the clearing equipment. A bulldozer performs best at about the center of the stream type. Unless the slope from the bank to the water edge is gradual a narrow strip of brush will be left unworked. Conditions at the outer edges of the stream type are generally unfavorable for bulldozer work, so all in all there is ample opportunity to work in advance of the mechanical equipment if necessary. The combination is sufficiently strong to deal with all variations in stream type conditions as they occur.

On such stream type areas as mentioned the eradication crew may be increased to work side streams and slopes. A rolling camp transported by the power available would tend to keep the organization intact and further increase the efficiency of operations.

CHECKING ORGANIZATION AND METHODS

E. L. Joy

Since the inception of blister rust control work in the West all areas eradicated of Ribes have been checked in one way or another. From 1922 to 1928, the experimental eradication period, checking was more or less combined with eradication methods and ecological studies. Since the inauguration of large scale practical control operations in 1929, the checking has been conducted by members of the disease study project in conjunction with other work of the department.

During the experimental eradication period the purpose of checking was chiefly to determine the efficiency of men. This was the logical purpose at that time because any practical control method evolved had to be based on man-efficiency data.

With the adoption of practical control methods checking no longer has for its major purpose the determination of man-efficiency but is performed for the purpose of ascertaining the quantity of Ribes per acre after eradication which in turn indicates the degree of protection afforded stands of white pine. The determination of man-efficiency is now a responsibility of the eradication supervisors although it may be possible to glean some information about group efficiency through a study of checking data.

In 1932 an organization was effected to check the areas worked from 41 camps. These camps were classed into 8 units with the number of camps and number of checkers in each as follows:

1. Priest Lake Timber Protective Association - 3 camps - 1 checker
2. St. Joe National Forest - 7 camps - 3 checkers
3. St. Joe National Forest - 6 camps - 3 checkers.
4. Coeur d'Alene Timber Protective Association - 1 camp - 1 checker
5. Clearwater Timber Protective Association - 4 camps - 2 checkers
6. Clearwater National Forest - 7 camps - 3 checkers
7. Clearwater National Forest - 6 camps - 3 checkers
8. Clearwater National Forest - 7 camps - 4 checkers

During the last half of June a training camp was conducted to instruct these men in methods and procedure of checking. For this purpose an area of approximately 12,000 acres which was worked in 1931 was checked. This area is a portion of the East River drainage located on the Priest Lake Timber Protective Association southeast of Coolin, Idaho, in townships 58 and 59 north, ranges 3 and 4 west.

During this period the men were trained in pacing, the use of a compass, Ribes live stem measurement, eradication type identification, mapping and analysis of data. The fact that the area on which the work was done was actually a completed unit, ready for check, gave the results of training work the same importance as those secured on 1932 work.

The checking procedure is designed to provide an impartial survey of the quantity of Ribes on an area after eradication. A regular sampling system is employed where data from sample strips 13.2 feet (.2 chain) wide and spaced at regular intervals according to the desired per cent check are computed to give the approximate amount of Ribes per acre by eradication type. It had previously been found that one man could, without difficulty, run strips of this size and secure accurate data.

It was believed that a 2 per cent sample of upland and a 4 per cent of main stream areas was both sufficiently accurate and low in cost to satisfy our needs. This was obtained by spacing the 13.2 foot strips 5 chains apart for a 4 per cent check and 10 chains for a 2 per cent. On a few upland areas 4 or 8 per cent checks were made chiefly for the purpose of determining the variation in error of the different per cent checks.

Accuracy of the checking data for one camp has been computed by Putnam by using the total data taken on 4,330 chains (86.6 acres) of strips as a 100 per cent check and the data from the necessary number of sample chain segments of the strips for the smaller per cent checks. He found that the per cent variation in feet of live stem per acre from actual or 100 per cent was as follows: 50 per cent check + 10.8; 25 per cent check, -3.2; 10 per cent check, -22.5; 8 per cent check, -26.9; 4 per cent check, + 27.4; 2 per cent check, + 25.3; and 1 per cent check, -50.0.

In general, the per cent of error in live stem becomes greater as the per cent check becomes smaller. The 50 and 25 per cent checks are close to actual. The 10, 8, 4 and 2 per cent checks are similar with an average departure of about 25 per cent while the 1 per cent check has an error of 50 per cent.

If a continuation of this study shows a similar trend we can conclude that a 2 per cent check is sufficiently accurate for our work. Then, by application of our correction factor (if this be 25 per cent) we would find it necessary to eradicate to a 40 foot limit, as determined by a 2 per cent check, in order to be within an actual limit of 50 feet.

For the summer assignments one checker was made responsible for the organization and direction of work in each unit. It was also his responsibility to summarize data for his unit and report on the progress of the work.

In addition to the areas worked in 1932 there was checked a large part of the 1931 worked acreage on both the Clearwater Association and National Forest.

The procedure followed was for the camp boss, upon satisfying himself that a block or working unit was completed, to designate this area as ready for checking. Upon completion of the check the data were analyzed to determine by type the amount of Ribes live stem per acre after eradication and these results reported to the camp boss. If the area of any type or types within the checked block supported over 50 feet of live stem per acre, a rough sketch map based on the strip data, which were recorded by chain segments would reveal the location of the larger amounts of Ribes. This confined the necessary reworking to only that portion of the area where the Ribes were too abundant.

Some of the problems in checking were:

(1) Not having sufficiently large areas to check at one time so representative data could be given to the camp bosses in time to be of greatest assistance to them.

(2) The difficulty in determining the limits of eradication on some areas.
(3) Not sufficient time in all cases to recheck portions of blocks that were reworked after the initial check.
(4) Usually the checker was rushed to complete the work of a camp before that camp moved because crews were completing several scattered blocks or units at the same time.

FURTHER COMMENTS ON BIOLOGICAL CONTROL

G. A. Root

Now that this subject has again come to the front as noted in the March issue of the Blister Rust News Letter, the writer may add a few ideas.

Pierson, in his article, suggests that biological control may be applied to getting rid of Ribes by finding some organism which will attack one or more of the component parts of the bush. Before attempting to expand on this type of control, I think one important point has been overlooked. When the subject of biological control is mentioned, particularly with reference to pest plants, there reverts to one's mind the classic examples of the work on the Prickly Pear in Australia, on the Lantana in the Hawaiian Islands and to a less degree on the Blackberry in New Zealand. In every case these plants are not indigenous but have been introduced in these respective countries. They have become pests because the environment was found favorable and those agencies which controlled their abundance in their original habitats are wanting; the "balance of nature" has been upset.

Our wild Ribes are native to the areas which we attempt to rid of these bushes. In one sense they have not spread to such a degree as to assume the status of a pest. The interaction of biological and other agencies has kept this genus within bounds in so far as a natural equilibrium of the surrounding flora is concerned. This, however, is beside the point--Ribes are a pest from the blister rust standpoint but not an introduced one, which makes its destruction that much more difficult.

There may be some way of encouraging or fostering the natural pests of Ribes whereby they will greatly increase and in turn cause a marked decrease in the number of bushes. We have seen the work of mildew, cane borers, fruit flies and leaf eaters many times but taken as a whole it has been insignificant. What would more nearly approach the true aspect of biological control would be the introduction of insect pests or plant parasites from a foreign country or from some region in this country, aptly suggested by Pierson. A new environment for these pests in the white or sugar pine belt might be so favorable as to cause unusual propagation and resultant death to Ribes bushes.

There is an element of danger in that introduced insects can exercise an immense and destructive effect upon cultivated crops. Again they may not remain confined to the particular genus for which intended but adapt themselves to the entire botanical family with dire results. Suppression of the blackberry in New Zealand has been hampered because the most promising insect, a Buprestid beetle, attacks other members of the rose family. One point is worth mentioning regarding general control by insects: An English authority says, "Root-borers, stem borers, and internal seed, or fruit-feeders are preferable to leaf-feeders since their economy is usually more delicately adjusted to specific hosts, and for that reason probably less liable to change in a new environment".

The writer believes the outlook for biological control in the blister rust field seems most promising in attacking the problem from the canker standpoint. A good start has been made in the study of Tuberculina maxima, and most certainly further study of the Arizona Fusarium is warranted. It is questionable whether the native fungi attacking the cankers will have a marked effect.

Biological control is a glamorous subject, one worth giving attention to, and concerning the Prickly Pear project a well known Australian authority says, "What is certain is that the method of biological control has proved the only method of attack on this tremendous problem, and that what was once a hopeless position is now viewed by everybody concerned with the highest favor as likely to yield a permanent solution of the problem".

ANENT BIOLOGICAL CONTROL

L. N. Goodding

Before me is a blister rust canker cut from a tree near Rhododendron March 11, 1933. Its blister rust possibilities had already passed into the limbo. This seems to substantiate at least to an extent Pierson's opinion that the pycnial stage is the weak link in the blister rust development. The canker had been inoculated with a fungus from Arizona. While inoculation on several cankers was made on both aecial and pycnial areas the only action evident has been in the pycnial regions. In this canker on my table the pycnial region is apparently completely parasitized.

Some side lights on this particular organism are remarkably in keeping with Pierson's ideas. Investigation may prove these side lights pure hallucinations. They should not, of course, be taken seriously until a better basis is established for them. But here they are: Chihuahua pine is abundant in the Chiricahua Mountains in Arizona. It is almost constantly associated with oak. Cronartium conigenum destroys Chihuahua pine cones completely. The oak is one of the hosts. The rust is comparatively rare. Is it possible the Fusarium has anything to do with keeping the rust in check? Again pinyon pine is very abundant in the Chiricahua Mountains. The Fusarium in question, judging it by its appetite for white pine blister rust would readily attack the closely related pinyon blister rust. There are plenty of Ribes associated with the pines. No pinyon blister rust has been found in the Chiricahuas. If it is absent or rare there, could the Fusarium be responsible?

I believe Pierson will agree with me that we should not assume that the pycnial stage is the weak link and close our eyes to other possibilities, but if we are to think with the rust we can hardly help feeling that the pycnial drops constitute fine media for many fungi. If we can get a fungus that penetrates the bark beneath the pycnial drop and follows up the mycelium, we at least have an organism that tickles the imagination.

To many of us the function of the pycniospores is a settled matter. It is hard to be a doubter in the presence of the evidence obtained from the study of other rusts. To admit sex in blister rust is to admit that strains of different degrees of virulence are certain to arise in the future. It is even possible that a hybrid of Cronartium ribicola and Cronartium occidentale may occur. The results of such hybridization can in no way be predicted. Rest assured no good will come of it. When and if this occurs we may have the greater reason to muster the biological control forces to cope with the inroads of blister rust.

Possibly if we supplement Ribes eradication with biological control today, tomorrow we will need only to supplement biological control with Ribes eradication.

HIGH LIGHTS OF THE MARCH 15 PERSONNEL MEETING

H. J. Hartman

C. C. Strong gave a paper on the use of aerial photographs on blister rust control operations. It was pointed out that aerial photographs in order to constitute an asset to blister rust control plans, must render valuable assistance in determining one or more of the following points:

1. Timber types and boundaries of each.
2. Timber age classes and boundaries of each.
3. Ground cover and working conditions.
4. Ribes conditions on upland areas.
5. Percentages of total area represented by stream type.
6. Ribes conditions in stream type.
7. Factors which would influence rust development.
8. Density of timber stand regardless of age.
9. Accessibility of timber stand with regard to future marketing costs.
10. Other economic factors such as degree of fire hazard, relative excellence of white pine stands, etc.

It was stated that only points number 2 and 8 of the above group can be determined accurately enough to be used as an aid in formulating blister rust control operations with our present knowledge and methods of aerial photography. However, these photographs give a general idea of all conditions on an area. This is of great value on areas where preeradication has not been conducted and upon which immediate information is needed. We may rest assured that pre-eradication ground work can never be entirely eliminated, but may be greatly reduced in volume and improved in quality through the use of aerial photographs. The use of aerial photographs in our work is still in the experimental stage. The future shows great possibilities as the technique of the photographic service is improved, as well as the ability of the field men to analyze the aerial photographs.

M. C. Riley discussed the protection of white pine for aesthetic purposes. It was stated that the objective of the National Park Service is to preserve everything in its natural state. Instead of considering white pine as the most valuable species it is only a tree. The main factor which determines the choice of areas to be protected is the number of people who will visit the area. In the Crater Lake National Park it was held that the aesthetic value of the Ribes species present was greater than that of the pine. In this case the pine may be sacrificed.

Roy Blomstrom gave a paper on blister rust resistant species of white pine. There are a number of immune and resistant species of white pine, of which Pinus excelsa, P. cembra and P. peuce at present show most promise of developing into trees of commercial importance in the United States.

Miller Cowling discussed why we use photography in blister rust control. It was pointed out that pictures play a large part in making a clear and concise report and that a good picture was worth ten thousand words. More pictures are needed in all lines of our work, especially regarding ecological and pathological studies. All field men should keep watch for new and better material for photographing.

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N E W S L E T T E R

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

A NEW PARASITIC FUNGUS ON RIBES

Virgil D. Moss

An imperfect fungus has recently been isolated, cultured on artificial media and identified by the author as a species of the genus Alternaria. Laboratory tests, conducted so far, show that certain members of the genus Ribes are very susceptible to the organism of which the complete host range has not yet been determined. A review of scientific literature indicates that this species has not been reported from North America. Dr. Jakob Eriksson in his manual of Fungus Diseases of Plants discusses an organism of the Fungi Imperfecti group known as Alternaria grossularia Jacz., which causes considerable damage to the fruits and produces heavy premature defoliation of the leaves of the common gooseberry in Europe. He fails, however, to give spore measurements or to mention any type of injury resulting in necrosis to seedlings.

The severity and relative swiftness with which the succulent Ribes seedlings succumb to this fungus is outstanding. In the laboratory tests, leaves of R. viscosissimum, R. cereum and the common cultivated gooseberry were surface sterilized, placed in petri dish moist chambers and then inoculated. Large irregular, greenish-black blotches appeared after two to three days as the mycelium advanced through the leaf tissues, these blotches gradually turning brown in color. The vegetative mycelium was able to exist and produce a luxuriant growth either saprophytically within the soil on dead organic material or parasitically on the Ribes seedlings.

It is believed that this organism of the genus Alternaria corresponds to Dr. Eriksson's species A. grossularia. There is sufficient evidence to warrant further investigation of this particular organism or others in combination with it for possible aid in the biological elimination of Ribes seedlings, that so numerously follow eradication operations.

THE CHANCES FOR BLISTER RUST IN CALIFORNIA

G. A. Root

Those who have studied rust spread and its attending factors come to the conclusion that weather conditions determine its spread and severity. When and where will blister rust be found in California? To what extent will it become a menacing factor to sugar pine?

Dr. L. H. Pennington (now deceased) was one of the first to study this subject. In 1925, in Vol. XXX No. 7, Journal of Agricultural Research, there appears under his authorship, an article "Relation of Weather Conditions to the Spread of White Pine Blister Rust in the Pacific Northwest". Although he dealt mainly with conditions and data in areas where the rust was present, he made several predictions with reference to Oregon and California which are worthy to note in the light of the present status of the rust.

Can we take California conditions and from them, based upon the salient features of Pennington's article, predict with a certain degree of accuracy, the rust problem for this state?

PRECIPITATION AND WIND DIRECTION IN NORTHERN CALIFORNIA AND THE SIERRA REGION

An endeavor has been made to pick our stations representative of general areas, which are of considerable importance from a rust standpoint. The moisture and wind condition of each are given in the following summary:

Average Precipitation in Inches and Prevailing Wind for Period Studied

Station	Number of Years*	Elev.	June	July	August	Sept.	Total or Average For Season	Wind Prevailing
Crescent City	15	125	1.76	.07	.46	2.56	4.85	N
Orleans	3	401	1.46	T	.00	.60	2.06	-
Hayfork	3	2,300	.58	T	.00	.30	.88	W
Yreka	15	2,625	.61	.39	.17	.65	1.82	N
Montague	4	2,450	.62	.05	.11	.33	1.11	N
Mt. Shasta	14	3,555	.97	.05	.20	1.05	2.27	N and S
Fall River Mills	6	3,340	.62	T	.01	.51	1.14	SW
Mineral	3	4,935	1.81	T	T	.96	2.77	-
Susanville	5	4,271	.46	.00	.00	.37	.83	SW
Quincy	11	3,409	1.07	.11	.29	1.04	2.51	SW
Las Plumas	3	506	1.49	.00	.00	.44	1.93	E
Sierraville	4	5,000	.74	.08	.04	.35	1.22	SW
Nevada City	15	2,570	.56	.03	.06	.79	1.44	SW
Blue Canyon	13	4,695	1.13	T	.10	.60	1.83	S
Tahoe	13	6,230	.62	.18	.27	.42	1.49	W
Placerville	15	1,925	.34	.01	T	.64	.99	W
Sonora	7	1,825	.66	.00	.02	.11	.79	SW
Hetch Hetchy	3	3,530	1.68	T	.03	.95	2.66	SE
Yosemite	15	3,983	.77	.15	.18	.72	1.82	SW
Three Rivers	4	870	.62	T	.06	.09	.77	SW
Giant Forest	5	6,360	.38	T	.11	.19	.68	NW

*Not always consecutive.
T Trace.

DISCUSSIONS AND CONCLUSIONS

Conditions on the coast, as represented by Crescent City with a total average rainfall of 4.85 inches, insure rust spread in the northwestern part of California.

The rust might make its way from the coastal region up the Klamath River drainage as far as Yreka. Orleans, with a rainfall of 2.06 inches would seem to substantiate this.

It is doubtful whether the rust will reach Hayfork and vicinity in

Trinity County for many years with only .88 inches. (Recent humidity studies do not seem to uphold this.)

If the rust should be found near Grants Pass, Jacksonville or Medford, Oregon with 1.25, 1.61 and 1.40 inches respectively (Pennington), conditions around Yreka with 1.82 inches would provide for its development, assuming a natural spread from the north. It is highly improbable that the disease will enter at points much east of Yreka.

Conditions around Mt. Shasta City are conducive to rust development. With a rainfall of 2.27 inches and fairly well distributed throughout the summer season, this point is quite important from a scouting standpoint.

Pennington says: ". . . Although it is scarcely possible that much, if any, infection may occur in the sugar pine region during the usual dry season,* it is very probable that abundant infection may occur in the occasional wet summers such as those of 1888, 1906 and 1913". He refers to the rainfall at Summit, California which was 7.51, 3.10 and 2.65 inches respectively, for those years. If this be true, spread of the rust would be possible at a number of points along the Sierra range, taking the lowest figure 2.65. If a 2-inch rainfall or thereabout should be taken as a minimum for rust development, as perhaps it logically can, one may expect rust along the higher elevations of the Sierras from Mineral south. Indications point, however, to a decrease of intensity and spread the farther south one progresses. Infections in general would be spotty.

Conditions east of the Sierra Nevadas would seem to inhibit much rust development except in the vicinity of Lake Tahoe.

Rainfall conditions at points along the western fringe of sugar pine in the foothills of the Sierra range, with few exceptions, would not be conducive to the development of the disease.

*June, July and August,--the writer added September.

COMPILATION OF CHECKING DATA

C. M. Chapman

In a preceding article "Checking Organization and Methods", is a brief outline of the checking method used in 1932. Only the field procedure is outlined there--just one side of the picture. How about the compilation of data? It is the purpose of this discussion to present the method of compiling checking data.

The following data were secured from eight strips, each 13.2 feet wide, spaced ten chains apart. These data constitute a 2 percent check of a 470-acre block designated "ready for checking" by the eradication camp boss.

TABLE NO. 1

BLOCK 3

Strip No.	Chain No.	Type	Chains of Type	R. petiolare Bu.	R. petiolare FLS	R. inerme Bu.	R. inerme FLS	R. lacustre Bu.	R. lacustre FLS	R. visco. Bu.	R. visco. FLS	Total Bu.	Total FLS
1	1-8	O.M.	8										
1	9	Str.	1	1	6			3	14			4	20
2	1-35	O.M.	35										
3	1-5	O.M.	5										
3	6	O.M.	1							1	1	1	1
3	7-49	O.M.	43										
3	50	Str.	1	1	2							1	2
3	51	Str.	1					1	3			1	3
3	52	Str.	1										
3	53	Str.	1			5	41					5	41
3	54	Str.	1			2	11					2	11
4	1-2	Str.	2										
4	3	Str.	1			1	8					1	8
4	4	Str.	1										
4	5	Str.	1	2	4			2	37			4	41
4	6	Str.	1					3	26			3	26
4	7	O.M.	1					1	1			1	1
4	8-62	O.M.	55										
5	1-8	O.M.	8										
5	9-15	O.R.	7										
5	16-18	O.M.	3										
5	.5	Str.	0.5	3	34							3	34
5	18.5-31	O.M.	12.5										
5	.5	Str.	.5										
5	31.5-58	O.M.	26.5										
6	.5	Str.	.5										
6	.5-53	O.M.	52.5										
6	54-63	O.R.	10										
6	64-68	O.M.	5										
7	1-64	O.M.	64										
7	65	Str.	1										
7	66-77	O.M.	12										
8	1-8	Str.	8										
8	9-32	O.M.	24										
8	.5	O.M.	.5					6	43			6	43
8	.5	Str.	.5										
8	33-107	O.M.	74										
Total		O.M.	430					7	44	1	1	8	45
Total		O.R.	17										
Total		Str.	23	7	46	8	60	9	80			24	186
Grand Total			470	7	46	8	60	16	124	1	1	32	231

Shown in the basic data are three types intersected 20 times requiring 37 type entries. Three Ribes species occur in one type, two in another and none in the third.

The smallest unit in basic checking data is the one-chain segment of strip. The first step in the compilation is to total, by species, the number of Ribes bushes and feet of live stem that were found in each type. For this simple example 77 entries and 56 additions are necessary to complete this step.

The second part is the per acre computation of bushes and feet of live stem by species, and total of all species, for each type and all types combined. For this computation the strip acreage in each type is computed by multiplying the chains of strip in this type by .02 (acres in each chain of strip). For each type the number of bushes and the feet of live stem found, divided by the strip acreage, give the bushes and feet of live stem per acre.

In Table No. 2 are shown the results of per acre computations for the data in Table No. 1. A total of 37 computations was necessary to complete this step.

TABLE NO. 2

SUMMARY OF CHECKING DATA FROM BLOCK 3

Type	Chains of Type	No. Acres Check-ed	No. Acres in Plots	Ribes Per Acre									
				R. petiolare		R. inerme		R. lacustre		R. visco.		All Types	
				Bu.	FLS	Bu.	FLS	Bu.	FLS	Bu.	FLS	Bu.	FLS
O.M.	430	430	8.60					0.8	5.1	0.1	0.1	0.9	5.2
O.R.	17	17	0.34									0.0	0.0
Str.	23	23	0.46	15.2	100.0	17.4	130.4	19.6	173.9			52.2	404.3
All Types	470	470	9.40	0.7	4.9	0.9	6.4	1.7	13.2	0.1	0.1	3.4	24.6

This completes the summary for block 3 but the computations have only started. The next step is to combine the data from several blocks into a camp summary and the final step is to combine the data from several camps into a forest unit summary. Each succeeding step must be based on the original data (strip area by types and number of Ribes found) and the entire process of calculation repeated.

FAST-GROWING TREES

G. A. Root

In a recent bulletin of the Institute of Forest Genetics, formerly the Eddy Tree Breeding Station at Placerville, California, some interesting information is given regarding tree growth.

In the nursery are Monterey pines (Pinus radiata) 6 years old from seed with a height of 21 feet and 4 inches D.B.H. A comparison of this species with sugar pine is shown in a photograph with the following legend:

Fast and Slow-Growing Pines

In the foreground are 2-year-old sugar pine seedlings only a few inches high; in the background are Monterey pines of the same age. Monterey pine is the fastest growing species found to date and one which may be of great value. The tallest seedling is 4.37 feet high.

There is a bit of irony that sugar pine happened to be the species taken for comparison. It is not a particularly good talking point for this species from this aspect.

Another notable growth has been made by a Royal hybrid walnut. In two years it grew from seed to a height of 10 feet and a diameter of 3.26 inches.

EXCERPTS FROM CAJAL

L. N. Goodding

The following excerpts are taken from the Scientific Monthly for March, 1933. They are so appropriate for certain ones in our work that I feel there should be a place for them in the News Letter. Perhaps after reading them you will all wish to peruse the entire article. It is Cajal's "Suggestions for the Scientific Investigator":

"The man of genius hardly bows to written rules--he prefers to make them."

"Far from becoming discouraged before the great authorities of science the novice in investigation ought to know that his destiny by cruel and inexorable law is to grow a little at the cost of the reputation of the great authorities."

"A knowledge of the German language is indispensable for one who would be up to date in a knowledge of current science. After German, English and French follow in importance." (This was written by a Spaniard.)

"It is known that a man mixes his personality with everything, and when he thinks he is photographing the external world he frequently contemplates and pictures himself."

"We render tributes of veneration to the one who adds an original work to a library and we deny it to the one who carries a library in his head."

"We have all seen teachers superiorly endowed, overflowing with

activity and initiative, possessors of sufficient means for investigation and yet who do not realize the value of personal work and never write. Their diciples and admirers await with anxiety the 'Great Work' which will justify the high concept of the teacher that they have formed; but the important monograph is not produced and the teacher continues without writing a word."

"For scientific work the means are almost nothing and the man is very nearly everything."

"It would be great fortune to meet with a rich and illustrious heiress who, abandoning the caprices and vanities of the sex, would consecrate her gold to the service of science."

"Mr. Billings, - - - - - , suggested to scientific writers the following rules: First, have something new to say; second, say it; third, stop as soon as it has been said; fourth, give the publication appropriate title."

Well, well, perhaps you'd better read the article!

SCORE ANOTHER FOR MECHANICAL ERADICATION

G. A. Root

That the use of heavy type machinery is supplanting other methods in getting rid of weeds and undesirable brush is evidenced by the following article taken from a recent issue of the Pacific Rural Press:

"A Chinaman recently had 450 acres of willow-covered bottom land to clear. The willows were cut and burned and then a '75' tractor with a rooter of the type which contractors use to tear up old roadways was given the job of handling the roots and stumps. The four teeth of the rooter sank 28 inches into the ground and what they hit came loose. A second tillage of the land at right angles to the first finished the job in short order."

WHEN TRAVELING, USE CHEAPEST FIRST CLASS ACCOMMODATIONS

Attention of employees of the Western Office is called to a paragraph of the Appropriation Bills for the Treasury and Post Office Departments which reads as follows:

"Whenever by or under authority of law actual expenses for travel may be allowed to officers and employees of the United States, such allowances in the case of travel ordered after the date of enactment of this act shall not exceed the lowest first class rate by the transportation facility used in such travel."

Employees of the Department of Agriculture are entitled to first class railway transportation unless otherwise specified in their travel authorization. Such travel, however, must be made at the lowest first class rate. A tourist sleeper is not first class; the standard Pullman sleeper may be used. Parlor car seats are not permitted for trips of short duration.

PREPARATION FOR THE CONSERVATION CORPS

The part thus far played by the Western Blister Rust Control office in the Civilian Conservation Corps program has consisted of numerous general preliminary arrangements and the operation of a training camp for camp superintendents. This was started at Clarkia, Idaho, on May 11 and continued until May 20. The results were that a considerable number of specially selected men were given a relatively short but very intensive course of training in purposes and methods of blister rust control and are now ready to go to the field in the capacity of camp superintendents.

The training school was opened with a general discussion of the problem confronting organizations administering blister rust work in the West. The background responsible for the adoption of the emergency conservation work program was covered very thoroughly. The general aims, to get work done as well as give the men employed the highest type of instruction in woodsmanship, forestry and conservation, planning and organization, were discussed at length.

Following the opening discussions the general subject of white pine blister rust was taken up. Mr. Wyckoff discussed the history, spread, development in Europe and America, life history, cycle, hosts, and concluded with a statement of the general situation in the Inland Empire.

Exhibits, pamphlets, articles and various other materials were provided for the use of men in training.

In the afternoon the entire group of men was divided into parties of about ten men each under the leadership of permanent employees of the Division of Blister Rust Control. The parties then proceeded to examine the blister rust along the Middle Fork of the St. Maries River east of Clarkia and to study the topographic features and other factors affecting the spread and development of blister rust. On each party discussions were held frequently as they moved from one location to another covering stages of the rust, rate of development, cycles, hosts, etc. which were discussed in the forenoon.

Following this general discussion regarding the nature of the disease and of its control, the balance of the training period was largely devoted to intensive instruction in field practices. As much time as possible was spent in the field. Rainy days and evenings, however, were devoted to further discussions and instruction in preparation of field records and reports.
On two occasions the Clarkia school board donated the use of the school building and light plant for illustrated lectures on the disease and control practices. Upon the first occasion slides were shown illustrating the disease and its effect on pines and the general phases of control. The second set of slides dealt particularly with the eradication work. Pictures of the various eradication types and the aerial views of several areas to be worked were analyzed and the information utilized to point out the probable density of Ribes population and the working conditions which would be encountered. The aerial photographs were also used as examples to illustrate our methods of making preliminary surveys.

Field work consisted of actual practice on control operations. The men were divided into small groups, each under the supervision of an experienced instructor. Both hand pulling and spraying methods of Ribes eradication were demonstrated to these men and were actually performed by them. Sufficient time was spent on these assignments so that each man was able to become familiar with the methods of work. They were also instructed in detail regarding the laying out of areas and blocks in preparation for crew work.

So far as can be judged, the camp superintendents' training school adequately accomplished its purpose. Numerous favorable reports both from those in attendance and from others who had occasion to visit Clarkia at that time seem to indicate that we have been able to develop a group of men originally selected for administrative ability in the field and who are now ready to assume the positions of camp superintendents and adequately meet the problems which they will there encounter.

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WESTERN BLISTER RUST

NEWS LETTER

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U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

THE EFFECTIVENESS OF 1927 RIBES ERADICATION IN CONTROLLING CANKER INTENSIFICATION ON THE BURNT CABIN CREEK AREA

E. L. Joy

The 1927 and 1928 experimental Ribes eradication on the Coeur d'Alene National Forest was planned to provide a control demonstration area when the rust invaded that region. Although no one was aware of its existence, stream type eradication along the North Fork of the Coeur d'Alene Ribes in 1927 was ended within only a few feet of a 1923 origin pine infection center at the mouth of Burnt Cabin Creek. Recent study of the spread and intensification of the disease on this area reveals encouraging information concerning the effectiveness of the work in controlling the rust.

The main area of infection extends for approximately 1/2 mile along the river in a stand of 10 to 25-year-old pine. General spread up the slopes does not exceed 4 chains. Occasional cankers were found for a mile along the river and 10 chains up the slopes.

Because stream type Ribes eradication ended at the center of infection, canker intensification rates have been computed for both the worked and unworked areas as well as at the original center which is just inside the worked area. The following tabulation gives these results:

COMPARISON OF AMOUNTS OF PINE INFECTION ORIGINATING BEFORE AND AFTER 1927 RIBES ERADICATION ON WORKED AND ADJACENT UNWORKED AREAS, BURNT CABIN CREEK, COEUR D'ALENE NATIONAL FOREST

Location of Area Sampled	No. Trees Studied	Total No. Cankers Found	Number Cankers Classified	Number Original Cankers (1923)	Cankers Formed During Intensification				Feet Ribes Live Stem Per Acre
					Before Erad.		After Erad.		
					1926	1927	Since	1927	
Original center worked 1927.	2	547	337	33	254	83.6	50	16.4	1,628
Within 5 chains of original center. Worked 1927.	10	232	181	3	146	82.0	32	18.0	1,628
Within 7 chains of original center. Unworked.	10	88	87	0	32	36.8	55	63.2	13,236

Assuming that the Ribes live stem per acre after eradication did not exceed 400 feet, the additional 1,228 feet is growth made during the 6 years from 1928 to 1933. Even with this large amount only 16 to 18 percent of the total number of classified cankers found on pines within the worked area were formed during the years 1928 to 1931, the four possible intensification years after eradication from which cankers would be visible in 1933. The 82 to 84 percent formed before eradication resulted from only 1926 and 1927 intensification, the first two years of aecial production on the original cankers.

In contrast to this reduction in canker intensification by Ribes eradication, infection data from pines on the unworked area show approximately 63 percent of the cankers to have originated in the four intensification years since Ribes eradication. Eight times as much Ribes live stem per acre, which consists of 80 to 90 percent R. inerme on both worked and unworked areas was responsible.

One important factor that gives even greater significance to the small amount of post-eradication infection on the worked area is that all original (1923) cankers found were located there. With an equal distribution of this aecial source on the worked and unworked areas, the difference in canker production since eradication would have been much greater.

A point of considerable importance that has been noted on several infection areas including that at Burnt Cabin Creek is the apparent low-infecting power of R. lacustre even in stream type. On the Newman Lake area where a very intensive study is being made of the infecting ability of this species, only a few cankers have resulted from abundant Ribes infection each year since 1928. At other infection centers it has been observed that the spread from R. lacustre is usually confined to bushes growing adjacent to or within a few feet of the trees. Additional observations and studies on this point along with the Newman Lake study will give more exact data from which to draw conclusions.

C.C.C. CHIPS ON THE CLEARWATER

B. A. Anderson

The cadres for the C.C.C. blister rust camps on the Clearwater National Forest arrived at Jaype, Idaho on June 14 and 15. The companies arrived on June 26 and 27. Practically all C.C.C. men were used on camp construction until July 10. During this period of camp construction, camp superintendents trained the men for eradication work daily in groups of about 30 men.

The 15 C.C.C. camps engaged on blister rust control have been divided into three units:

1. Camps F5, F6, F9, F10, and F11 with L. L. White in charge.
2. Camps F7, F8, S214, P215, P216 and S217 with F. J. Heinrich in charge.
3. Camps F12, F13, F14 and P212 with C. H. Johnson in charge.

During the week of July 10 to 16, approximately 40 percent of the men were available for field work. At the present time about 70 percent of the camp enrollment is available for eradication work. The daily average of men turned out for the week July 17-21 was 137 men per camp; for the week July 24-29 the average per camp was 133 men. Taking all factors into consideration, it is quite doubtful if this average will be increased.

A weekly summary of work done is compiled and distributed to all camp superintendents. During the past week 1,272,000 Ribes were removed from 7,000 acres of upland and 1,000 acres of stream type. In addition, 23,500 gallons of Atlacide spray were put out. Preliminary checks of worked areas indicate

that the work being done is excellent. Camp superintendents, foremen and checkers agree that there is a marked daily improvement in the work and attitude of the boys.

With the exception of local quotas, the C.C.C. personnel was enrolled in the smaller towns in up-state New York. It was an agreeable surprise to find at least a dozen men who had worked on blister rust control projects in the East. The men do not average over 20 years of age. Because of their youthfulness, at the time the depression started, many have never held a regular job before. As a result our work has been considerably increased due to the fact that we have not only had to teach the men a new occupation, but how to work as well.

It has been necessary to weed out only a small percentage of chronic complainers, agitators and "sick, lame and lazy". The morale of the men has been excellent; very little trouble has been experienced with the men in the field. They have adapted themselves to Idaho conditions remarkably well, and have shown a willingness to do a fair day's work.

We have just received word that boot calks are being furnished. They were badly needed. In every camp there is hardly a boy who hasn't been hurt because of the lack of calks. Bruised legs, sprained ankles, etc., are the order of the day in every camp. Anyone who has ever tried to climb a needle-covered, steep mountain slope while shod with slick-soled shoes will appreciate the situation.

I doubt if there is a finer aggregation of camp commanders on any C.C.C. project in the United States. They have done their very best to promote the welfare of their men and to make a smooth running organization of their camps. They have cooperated in every way to make the C.C.C. program a success.

We are all happy members of the "woodpecker army" down here; homeless foresters, horseless cavalrymen, postless soldiers, Cuba-less marines, dryland sailors and the C.C.C's. Our one aim is to help make a success of the President's plan; we believe that the Clearwater project is functioning.

BLISTER RUST CONTROL EMERGENCY CONSERVATION WORK ON THE ST. JOE NATIONAL FOREST

H. J. Hartman

The blister rust control conservation project on the St. Joe National Forest is composed of fourteen camps, nine of which are Forest Service camps and five are state and private camps. These camps embody nearly 3,100 men enrolled chiefly from New York City. These men will all be employed on Ribes eradication work during the summer months.

Shortly after the close of the supervisory training school, held at Clarkia, Idaho, the camp superintendents were assigned to their camp areas. Preliminary survey work on the areas and the planning of individual camp operations were started at once. This was followed up by a training school for foremen, who were trained for one week and then assigned to the various camps

to start planning work on the individual blocks to which they were assigned by the camp superintendent in charge. All field detail was made ready for the arrival of the C.C.C. workers.

Also during June, W. F. Painter, the checking operation superintendent in charge, conducted a training school for checkers, who were also assigned to their respective camps to be on hand to help train the newly enrolled men for blister rust control work in the Far West.

Seven advanced C.C.C. parties, of 25 men each, arrived June 17 and by the evening of June 19 all cadres were in the field. These cadres started camp construction and other preparations for the arrival of the remaining portion of their companies. On June 23 the first full companies arrived for three camps and by noon on June 25 all companies had arrived and were in their respective camps. The busiest day of all was the unloading and transporting of the equipment, supplies and men of nine companies to their camp sites. Several of these companies were transported by truck for distances up to 20 miles over rough roads.

Actual Ribes eradication started on June 26 with over 1,000 men turning out for field work the first day. Moderate rains during the last few days of June greatly delayed field operations.

Camps Nos. F39, F40 and F41 are in the vicinity of Emida, Idaho. The field work in these camps is under the supervision of Donald Williams, unit project supervisor.

Camps Nos. F42, F43, F44, F45, F46 and P208 are located in the general vicinity of Clarkia, Idaho, and the field work in these camps is headed by Frank Walters, unit project supervisor.

Camps Nos. F47, P209, S210, P211 and S213 are situated in the general vicinity of Bovill and Elk River, Idaho. The field work in these camps is headed by Sidney McLaughlin, unit project supervisor.

With nearly 3,100 men, 1,400 trench picks, 100 axes, 100 Pulaskis, 14 tons of twine, 100 tons of chemical, 240 spraying units and adequate transportation in the field coupled with well trained field supervision and the keen cooperation of the Army officials in charge, the Ribes population of the western portion of the St. Joe National Forest will be greatly reduced; also a large number of men will be given valuable woods training.

THE USE OF AMMONIUM THIOCYANATE FOR THE DESTRUCTION OF RIBES

H. R. Offord

The observation that the thiocyanates are effective plant poisons was made by Mouillefert and also by Krausch in Europe about fifty years ago. Doctor Peterson of the Koppers Research Corporation is given credit for recalling attention to this early observation and his company has for the past four years been making a study of the weed-killing properties of ammonium thiocyanate. Interest in the use of ammonium thiocyanate for the destruction

of Ribes and barberry plants by this Division dates from December, 1930 when Mr. V. Sauchelli of the Koppers Research Corporation informed the writer, in the course of a personal interview, that his company would be able to furnish to the weed trade a limited amount of a technical grade of ammonium thiocyanate at a price of eight to ten cents a pound. Because of the fact that this chemical can be recovered from the waste liquors of gas-scrubbers by a comparatively cheap plant process of filtration and evaporation and further, since every coke plant throughout the country is a potential source of ammonium thiocyanate, the prospects of this chemical for herbicidal use seemed to be very favorable on the score of both price and availability.

Accordingly the chemical investigations unit at once commenced greenhouse experiments on the toxicity of ammonium thiocyanate to Ribes and barberry. These experiments have been in progress at Moscow and Berkeley during the past three years. In 1931 field tests of this chemical were undertaken on R. roezli in California and on R. inerme and R. petiolare in Idaho. The results of these preliminary tests were sufficiently encouraging to justify a test of this chemical in 1932 by the methods project while at the same time more exacting experiments on dosage were carried on by the investigative unit. The results of the 1932 experiments at Blewett Pass (chemical investigations) and Orogrande Creek (methods) conclusively demonstrate that ammonium thiocyanate is a very effective chemical for the destruction of R. inerme. The following data prepared by Van Atta following his check of the 1932 tests at Blewett Pass show clearly how ammonium thiocyanate compares with sodium chlorate, the heretofore most effective chemical.

PERCENT OF R. INERME BUSHES
KILLED BY SPRAYING

Concentration	Pounds Per Acre	Percent Bushes Killed by NH_4CNS	Percent Bushes Killed by $NaClO_3$
1.75# per gal.	3,500	97	84
2.50# " "	2,500	73	60
2.50# " "	5,000	100	89

Swanson reported several 100% kills of R. inerme on his rod plot tests on Orogrande Creek with 10 to 16 pounds of chemical per square rod applied in two doses of from 2 to 8 pounds for the first application and 8 pounds for the second.

On the score of safety to man and animal ammonium thiocyanate is unquestionably superior to sodium chlorate. The fire hazard, aside from the usual risk of dead and dry brush, is entirely eliminated by the use of ammonium thiocyanate; and while certain investigators state that the thiocyanate is as toxic or more toxic weight for weight, than sodium chlorate if taken internally by man or animal, all of these experimentors commend upon the marked distaste for the thiocyanate shown by browsing animals such as horses, cows and sheep.

Because of the facts that have just been presented, the writer

unhesitatingly recommends the use of ammonium thiocyanate for the destruction of _R. inerme_.

Experiments with thiocyanate on _R. petiolare_ have not been nearly as extensive as those on _R. inerme_ nor have the results been so encouraging. It is certain that _R. petiolare_ can be killed by means of a heavy soil and aerial treatment with ammonium thiocyanate but according to the best information available the quantity of thiocyanate needed for effective work is greater than in the case of sodium chlorate. This statement is made partly on the basis of 1931 tests at Blewett Pass undertaken by the investigative unit and partly on the basis of the 1932 methods experiment on Shake Creek. In the latter experiment ammonium thiocyanate 1/2 pound per gallon of water was applied to an area of _R. petiolare_ (which the writer would describe as an easy eradication chance) in a quantity certainly in excess of that which would have been used in ordinary crew work with sodium chlorate. Swanson reports that results were very poor on this experiment and further, that even the heavy applications of 10 and 15 percent ammonium thiocyanate failed to kill 100 percent of the bushes. Since the top affect is so important for _R. petiolare_ more effective use of a definite amount of chemical may be accomplished by using 2 to 2.5 pounds of thiocyanate per gallon of water.

It is hoped that a final decision regarding the effectiveness of ammonium thiocyanate to _R. petiolare_ can be made early next season following a check of the present experiments being conducted by the investigative unit and of the large-scale comparative test of ammonium thiocyanate and Atlacide now being made by the methods project. In any event the premium that this Division is willing to pay for a comparatively nonhazardous chemical such as ammonium thiocyanate will greatly influence the final choice between thiocyanate and chlorates.

CONCERNING THE ROOTS OF RIBES INERME

C. R. Quick

During the field season of 1932 the writer and Jack A. Vogtmann spent several weeks in Idaho studying the root systems of lowland-type _Ribes inerme_. The intent in part was to determine if possible the causes of the great variation in effectiveness of chemicals on this species. The writer has recently completed two weeks' field work on the rooting habits of _R. inerme_ on the 1932 Swauk Creek plots.

Certain things which have come out of this work on roots might be of interest to others. The general ideas expressed are not to be taken as final, but rather as certain things with which the writer has been impressed during the field work.

It may be that _R. inerme_ is "normally", or innately, shallow-rooted in the sense that in general the roots of this plant are superficial in the type of place in which the species usually occurs. However, certain ecological factors appear of importance in the determination of rooting habit.

The distribution of roots of _R. inerme_ is quite markedly modified

by the distribution of organic matter in the soil. In large numbers of plants the great majority of roots occur in the lowest layer of disintegrated duff and in the first few inches of humus-rich loam immediately beneath the duff. Soils with little or no humus seem to have no "attraction" for the roots. Of especial note is the limiting of root penetration by strata of sand, gravel, or rocks. Such strata widely underlie areas where R. inerme grows abundantly, and in such locations the use of chemicals should give very satisfactory results if the inhibiting strata are within eight inches or a foot of the soil surface. Many bushes have roots which penetrate deeply into sand and gravel, but the number per bush of such deep roots is usually small, and the bush is not particularly strengthened against chemical eradication by the few deep roots.

In excavating treated bushes the decided root-protecting influence of wholly and partially disintegrated wood debris has been apparent. The duff is in general physically and chemically well constituted to prevent the penetration of chemicals in aqueous solutions. The readiness with which the duff is penetrated by chemicals in solution is obviously of great importance if roots are to be killed. If all stem tissue is to be put out of action the chemical solutions must be forced through the duff which naturally piles up around the crown of a bush.

It would seem that R. inerme roots have no difficulty in functioning properly even though permanently below water level, providing that the water and soil are not deficient in oxygen. But poorly aerated soils, even though rich in organic matter, seem to prohibit root development. Areas were found on the east fork of Merry Creek at Clarkia, Idaho, in which all roots entering a certain layer of water-logged, foul-smelling, bluish clay were abruptly rotted off. Lack of aeration was the most obvious cause of the death of the roots in this strata. Some of the most deeply rooted plants have been found on uniform, well-aerated, sandy silt. In one location of this type on Swauk Creek the soil was found to be of practically the same character at a depth of three feet as at a depth of three inches. Bushes on this location and roots penetrating below three feet.

The water table in soil may force roots to be superficial by restricing aeration, etc., but usually the water table is not the limiting factor in root penetration. In excavating Ribes bushes in Idaho stream flats, the writer was surprised at the wetness of the soil. Even when the water table was a couple of feet down, the surface soil was many times actually wet. In addition to restricting aeration this water seriously dilutes any chemical solution which gets into the soil.

From certain observations it would seem that when R. inerme is in close root competition with other brush, which normally is somewhat more deeply rooted than the Ribes, the shallow rootedness of the Ribes is accentuated. Data on such a point as this last are hard to collect, and the generalization is necessarily weak.

The study of root systems will continue through part of the present summer, and it is hoped that by the end of the field season more definite conclusions can be reached.

METHODS PROJECT, CLARKIA, IDAHO
Virgil D. Moss

A few words to introduce the field working plan of Methods Camp at Clarkia, Idaho. In brief, our experimental purposes are: (1) to compare the effectiveness of Atlacide and ammonium thiocyanate on R. inerme and R. petiolare and in so far as possible on R. lacustre, applied as a spray and surface drench, using general field methods of application, (2) to compare the effectiveness of several different dosages and concentrations of each chemical, (3) to compare the effectiveness of two treatments of chemical applied in one season with a long period between each treatment, with the effectiveness of a single application of a larger quantity of chemical and (4) to formulate a set of instructions readily usable by the eradication forces for applying specified dosages of chemical per unit of area. Twelve plots in all have been established along the St. Maries River below Clarkia, six of Atlacide and six of ammonium thiocyanate. The individual plots range between two to three acres in gross area and contain not less than .7 of an acre of Ribes net area. The stream type is composed of the typical R. inerme and R. petiolare types along with a dense entanglement of various species of brush and small trees. Chemical knapsack units are being used by a crew of eight spraymen. Although it is rather early in the season to forecast results, I will go so far as to say that we are well pleased by the showing ammonium thiocyanate is making, particularly on R. inerme. I am in hopes that when the next news letter goes into print I shall be able to discuss to a limited extent results of the various treatments.

THE BLISTER RUST CONTROL BRUSH REMOVER
J. F. Breakey

The removal of brush from open stream bottoms on forest lands for white pine blister rust control proved feasible last season when 72 acres were cleared by heavy tractor equipment.

The purpose of this machine is to tear the brush and roots from the ground leaving it clear to plant grass in their place. To remove the brush is not enough. The brush must be left in shape for burning. To do this some disposal of the dirt at the time the brush is removed from the ground must be effected.

A plan for constructing a machine that will not only dig up the brush and carry it to large piles or windrows, but that will also separate the majority of the wet earth from the roots, has been worked out.

In order to make the machine as effective as possible for this particular type of work a new 50-Caterpillar was purchased from the Engineering Division of the Forest Service. This new machine was equipped with 18" closed type track shoes to insure maximum footing in soft ground. The Caterpillar Tractor Company factory shipped a center controls unit for use on this machine which places the gasoline tank behind the driver, raises the driver's seat up 4" and in all improves the vision of the operator a great deal.

The Master Equipment Company, Los Angeles, early in May shipped a bulldozer to Spokane for trial. We wished to determine its adaptability to the Caterpillar tractor and also test the machine itself when handling heavy loads and working over rough ground.

Repeated trials were held and the machine performed well under all tests. The bulldozer was purchased and the tractor and bulldozer attachment were then taken to a machine shop and the construction of a special brush rake grubbing arrangement was begun.

The machine that was used last season looked like a locomotive cow-catcher on a tractor. A set of ten teeth was fastened to a frame which was held rigidly at the front of the machine. The teeth were set 50 degrees from the horizontal plane of the earth and upon advancing the tractor forward the roots and brush were literally lifted from the ground.

The same general idea of raising the brush and roots out of the ground is used on the present machine. The ten teeth are set at 55 degrees. They are 10-3/8 inches apart. The two outside teeth are solid and to each of them is bolted a shear for cutting the roots at the side of the machine. The eight center teeth are each in two sections placed side by side and between every pair is a moving shaking bar. This bar is run on an eccentric at the upper extremity and is held by a clevis and spring at the lower end. The spring is to allow the shaking assembly to recess whenever the pressure on the faces of the teeth becomes great and the strain on bearings and eccentrics is excessive.

The eccentrics and shaking bars are driven from a central shaft which is in turn driven from a small motor at the rear of the tractor. The speed is 150 r.p.m.

A rack for excess brush is placed above the digging teeth. All drives and bearings are enclosed.

As the brush, roots and wet earth advance up the face of the grubber assembly the shaker causes the dirt to fall away between the teeth instead of matting up on the face of the machine.

The grubber was shipped to Honeysuckle Ranger Station, Coeur d'Alene National Forest on July 8 to continue the clearing started there last fall.

* * * *

Owing to the rush of work both in the field and in the office, in connection with the inception of C.C.C. work, the Western News Letter was discontinued for June and July. The August issue represents the resumption of News Letter publication. Each project leader and unit supervisor is enjoined to submit articles concerning any phase of the work on his project. The success of the News Letter depends on the men in the field where the work is being accomplished and problems met. You are all hereby appointed News Letter reporters.

Vol. 8 No. 7

December, 1933

WESTERN BLISTER RUST

NEWS LETTER

* * *

Confidential

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INDEX

U. S. Department of Agriculture
Bureau of Plant Industry
Western Office Division of Blister Rust Control
Spokane, Washington

EDITOR'S NOTE:

The following articles are resumés of short talks given at the December personnel meeting. It seems desirable to present this information for the News Letter with a less detailed explanation of things as they occur in the field. In looking over these various articles one thing seems apparent--that we were all busy, interested, and picking up a few facts to include with our other knowledge of blister rust.

Valuable information on things occurring in the field could be obtained for the News Letter if all members of the organization were asked to write brief articles on their past season's work.

CHECKING FOR FIELD SEASON OF 1933

H. E. Swanson

The checking organization was confronted with the problem of training 165 to 170 checkers, most of whom had no experience in pacing or compass work or in the location and use of land survey marks. Many of the men had no previous experience in blister rust control work.

Actual checking work did not get under way until the latter part of July. Until that time the checkers assisted in the training of CCC boys or the new men in the regular camps. The record shows that on the three projects the time spent by checkers on activities connected with and necessary to checking areas ranged from 67 percent to 71 percent. The rest of the time was spent on work directly connected with Ribes eradication.

A total of 8,366 man days were chargeable to checking and 3,586 were spent on eradication. The problem is such that in checking the work during the current season it is not possible to determine exactly the number of men needed to check the area. If work were checked the following year, this would be possible. The extent of the area would be known and there would be no delay in waiting for the completion of blocks. However, to check the current season's work it is necessary to have available a sufficient number of men to handle the work, and the time which is not used on checking can be used profitably in regular eradication, a policy which the checking organization endeavored to follow throughout the summer.

On account of the special problem connected with the supervision of the CCC boys, the eradication foremen were unable to make any adequate supervisory check on their work, and in many cases preliminary inspections were made by the checkers, who also reworked some of the area, before they went in to make the regular strip check. Also, all areas that were reworked after being checked were rechecked. In a few cases this rechecking was necessary three or four times. Approximately 500 man days were spent rechecking areas.

Another function taken over by the checkers was the making of an advance check for the purpose of eliminating areas with few Ribes from crew work.

A summary of the checking work shows:

183,000 acres of worked area checked
77,000 acres in area advance checked
44,000 acres in the advance checked area eliminated from crew work

On practically all worked area and all area eliminated from crew work, a 4 percent or higher check was made. The area actually covered on the check strips represents 11,282 acres. 5,300 man days were required to cover this ground on the final check which was made. This represents 2.1 acres or 105 chains of strip per man day. In comparing this with average man days spent per acre on eradication work performed in the past, it tends to show that the rate of covering the ground is about the same for checking and eradication. The pulling time for eradication crews ranges from 6 percent to 30 percent of the total time to work an area. This pulling time is offset in the checkers' work by the pacing and compass work necessary, the offsetting from one strip to another, and the tying in with landmarks. If large solid blocks were always available for checking the amount of strip run per day would be greater.

The point of this discussion is to bring out the fact that checking work performed at such a rate can only give an approximate measure of the Ribes live stem remaining on an area. However, the other feature of checking which serves to locate the bad areas and plot the data on a map in order that crews may go back and mop up the poor work is probably the most direct benefit of checking. There are tied up in this point, elements which have a direct bearing on the method in which checking will be done, and shall be postponed for consideration until checking methods are taken up in a future meeting.

As a whole, the greater part of the work performed this year was highly efficient as to amount of live stem left on the area. However, on many areas there will be a heavy comeback of Ribes from crowns left in the ground.

As to the efficiency of the work on the various projects the work in the regular Forest Service camps on the Coeur d'Alene ranged from 2 feet of live stem per acre on 1,200 acres to 56 feet of live stem on 107 acres. The work of the CCC camps ranged from 13 feet of live stem to 73 feet of live stem; on the Clearwater the CCC work ranged from 11 feet of live stem to 113 feet of live stem; in the NIRA camps 11 feet of live stem to 29 feet of live stem; on the St. Joe in the CCC camps 5 feet of live stem to 79 feet of live stem; in the NIRA camps 5 feet of live stem to 16 feet of live stem.

25-MAN CAMPS ON THE COEUR D'ALENE NATIONAL FOREST

M. C. Riley

At the start of the 1933 field season it was expected that there would be 11 CCC camps engaged on blister rust work on the Coeur d'Alene National Forest. While the training camp, which started on May 24, was in progress at Wolf Lodge, word was received that there would be 6 CCC camps and 25, 25-man camps; the latter to be financed by a regular Forest Service appropriation.

These small camps were located on the western half of the forest. Although there were 25 district camps, there were only 24 camp locations since two camps utilized the buildings of the Winton Lumber Company at Camp 14. Although they are commonly called 25-man camps, they usually consisted of a camp boss, cook, flunky, checker, and at least eight 3-man crews. Some of the first camps established were composed entirely of experienced men who had previously worked on the Clearwater, St. Joe and Priest Lake operations and these men were later distributed among the other camps.

The supervising overhead consisted of a representative of the Forest Service, a project leader and six unit supervisors. These unit supervisors were responsible for the work of from three to six camps, the number depending largely upon their location.

Men reported to the first camps on June 12 and the last camp was established on July 14. The equipment necessary for about ten camps was supplied by the Division of Blister Rust Control and the remainder was furnished by the Forest Service. The regular Forest Service appropriation was used until September 4 when crewmen started working under the NIRA appropriation. Camp bosses and checkers were paid from NIRA funds starting on September 14. On August 24, 75 additional men were employed as replacements for the usual number of casuals and 300 men were added on August 25 when NIRA funds became available. These men were all distributed among the existing camps.

No chemical eradication was conducted on the Coeur d'Alene National Forest this past year. One camp slashed and burned the Ribes and associated brush on 14 acres of stream type and the remainder of the work of these camps was done by the hand eradication method.

A central warehouse was established at the Honeysuckle Ranger Station and all supplies and equipment were cleared through this point. Pack strings were used for eight camps, one camp was supplied by railroad speeder and the remainder were supplied directly by truck.

The first camp was moved out on September 23 and the last one on September 27.

BULLDOZER RIBES ERADICATION - 1933

John F. Breakey

During the 1933 field season beginning July 15 and ending November 1, a total of 157.8 acres were cleared by bulldozer method. This clearing was all done on the Coeur d'Alene National Forest, and all but 47.50 acres (Tepee Creek, Magee Ranger Station) was on the Little North Fork of the Coeur d'Alene River. Clearing on the Picnic Creek flats which are 2-1/2 miles upriver from Honeysuckle Ranger Station, included 28.25 acres. 23 acres in the immediate vicinity of Honeysuckle Ranger Station were cleared, 10 acres at Burnt Cabin Creek 10 miles up from Honeysuckle Ranger Station, and 49.15 acres in the vicinity of Horse Heaven Ranger Station. Heavy Ribes areas were located by supervisors on the ground and the

bulldozer crew, with maps furnished by the supervisors, concentrated their activity on the spots indicated. The scattered acres of Ribes indicate the difficulties encountered in transportation of fuel to the machine, repairs and camp moves necessary to the progress of the work.

The 10-man camp was separated into two crews, a machine crew and a slashing and powder crew. The 4-man machine crew was divided into two units consisting of a tractor driver and ground pilot in each case. The machine crews worked two shifts, one starting at 4 a.m. and continuing until 7 a.m., the second crew taking the machine at 7 and working until 12 noon, being relieved at that time by crew No. 1 and again going on at 5 p.m. and continuing until 8 p.m. The powder and slashing crew worked from 7 a.m. until 4 p.m.

A total of 158 acres were worked by machine. This was done in 808 machine working hours. An analysis by months including cost of burning shows:

Month	July	August	September	October
Acres	18.8	42.5	43.5	53.0
Cost	$94.27	$61.65	$52.87	$37.18

51 acres were burned and planted to grass or trees.

The 1933 work has taught us:

That land drainage ten days or longer previous to clearing is very essential.

That the proper training of men for this type of work requires at least two months' time.

That the speed of clearing by machine depends upon the degree of correlation of activities of the ground pilot and machine driver.

That the machine has demonstrated with proper handling the cost of clearing and burning can be kept below $50.00.

THE 1933 RIBES ERADICATION PROGRAM-NORTHWEST

C. C. Strong

In this discussion the history of 1933 work was reviewed together with the discussion covering the ECW program and the administration of work under Regular and NIRA appropriations. Special attention was given the cooperative set-up between organizations involved, preparation for handling the work, difficulties met conducting field work and the progress and evaluation of work done.

It was stated that, although there is plenty of room for improvement in conducting ECW programs, the organization should feel a certain degree of

satisfaction that the work proceeded as smoothly as it did. This success is largely attributed to care in selection of supervision and facilitating personnel and thorough training of these men before they tackled field assignments. In selection and training of personnel, this Division and the Forest Service cooperated with no conflict over divided responsibility. There is a growing conviction that the ECW program, with the improvements which come with experience, is a much needed institution and is here to stay. If it does develop into a more or less permanent program, some ECW camps should be assigned to blister rust work each year and every effort be made to make the program productive of desired results.

The work financed from regular and NIRA appropriations was productive of results comparable with previous regular work. Although NIRA crews got away to a late start they were responsible for nearly 8 weeks of highly productive work being done, and demonstrated the fact that Ribes eradication under favorable conditions can be conducted to a much later date than formerly was deemed advisable.

After annual reports on work done are disposed of, the most important undertaking will be the construction of maps and summarization of data necessary for a master plan of blister rust operations in each forest area where blister rust control is likely to be undertaken.

Some of the special problems now confronting Ribes eradication forces are:

1. What is the status of bulldozer work as a method of treating areas having heavy concentrations of *R. inerme*?

2. What is the status of slashing and burning as a method of treating areas having heavy concentrations of *R. inerme*?

3. Employment policies.

4. Standards of efficiency for gauging work done. Are our present standards so high as to throw the cost of initial work out of line with levels which might be maintained with less exacting requirements on initial work followed by careful rework after several years have elapsed?

RESUME' OF RIBES ERADICATION WORK IN SOUTHERN OREGON FOR 1933

C. Wessela

The first Ribes eradication work in southern Oregon was done near Woodruff Meadows in the vicinity of Prospect, Oregon, in 1925. In 1927 this same area was partially reworked, mainly to check the effectiveness of the 1925 project. Through funds made available by the NIRA appropriation, eradication work was continued on areas adjoining the previously worked area. Two 25-man camps were established August 28 and closed October 20.

All the personnel for this year's project were hired through the Jackson County NIRA Relief Agency. Of the 54 men reporting for work, one had previous blister rust experience. Considerable time was lost in the beginning training these men in methods of Ribes eradication and teaching them to identify the eight species of Ribes encountered on the areas worked.

The area worked this year was for the most part flat or rolling with occasional rocky and precipitous buttes occurring throughout the area. These precipitous buttes made eradication hazardous at times, for men were lowered over the sides on ropes in order to pull Ribes bushes occurring on the faces of cliffs.

Timber types occur in the following order of numerical importance: Douglas fir, sugar pine, white fir, (_Abies concolor_) Western white pine, yellow pine, incense cedar, and hemlock. The predominate species of brush occurring on the area are Ceanothus, vine maple, and ninebark.

Open mature proved to be the predominate eradication type comprising approximately 78 percent of the area worked this year. This type is really an overmature stand which is opening up and allowing reproduction to become established as an understory. Dense pole and dense mature types are comparatively scarce and are practically Ribes free. Open reproduction comprised approximately 7 percent of the total area worked. Ceanothus brush made eradication difficult. The type encountered which was most difficult to work was a meadow type with patches of brush. On these meadows heavy concentrations of _Ribes klamathense_ occurred. _R. klamathense_ is very similar to _R. inerme_ found in Idaho except that it grows larger and has long sharp thorns. Concentrations of this species were slashed clean with axes in order to pull the bushes.

The stream type Ribes in most cases were comparatively easy to eradicate except in some swamps where heavy concentrations of _R. klamathense_ occurred.

Approximately 6,000 acres were covered this year and 47 Ribes bushes pulled per acre. Most of these Ribes occurred on the meadow and stream types. _R. cruentum_ was the predominate species of Ribes found on the open mature type, occurring on dry, rocky ridges and buttes. The open mature type is admirably adapted to scout crew work since Ribes occur only on the high rocky ridges. Approximately 3,000 acres were covered in this manner. The open reproduction type carried very few Ribes. Figures show that approximately 62 Ribes bushes per acre were pulled, which is interesting compared to Idaho figures.

A good start has been made toward blister rust control on the sugar pine and Western white pine stands on the Rogue River drainage. Work was begun late this year and the inexperienced personnel made the eradication work more costly than it should have been. However, compared to conditions in Idaho, Ribes eradication on the sugar pine type on the Rogue River drainage should be cheaper.

ST. JOE NIRA CAMPS

Frank Walters

On August 20 a meeting was called in Spokane, at which time plans were laid for the establishment of NIRA camps on the various projects. Seven camps were allotted to the St. Joe. Because of the speed with which supplies were secured and shipped out of Spokane, it was possible to have all 7 camps established and in full operation on August 28.

Fifty-man camps were used, the overhead consisting of a camp superintendent and two foremen; each foreman being directly responsible for a 25-man crew. This set-up proved very effective, particularly in handling the large untrained personnel.

That the NIRA camps were worthy of their hire is witnessed by the fact that 11,129 acres of stream and upland were covered and 2,668,365 Ribes pulled. The work of three CCC camps was tied together, forming a solid worked area of 29,000 acres. The caliber of the work was very high, three camp areas showing a check of 8 feet or less. The highest check recorded on any camp area was 16 feet.

Had it been possible to have a longer season and less inclement weather a great deal more would have been accomplished.

ACTIVITIES OF THE DISEASE STUDY AND SCOUTING PROJECTS, 1933

E. L. Joy

Work of these projects for the past season can be divided into 3 parts which are (1) continuation of the Newman Lake plot studies throughout the season; (2) checking permanent stream type Ribes plots, pine plantations and studying canker intensification at several infection centers during June, July and August; and (3) scouting in northern California during September and October. Briefly, the high points in this work are as follows:

Newman Lake Plot. Since the removal in 1929 of *Ribes inerme* that grew at the rate of 3,100 feet of live stem per acre, there has been an extremely small amount of white pine infection resulting from 2,100 feet of *R. lacustre* per acre that was left on the area. The tabulations of the cankers found in 1932 and 1933 show only 9 that were formed in the years 1929-31 as opposed to approximately 2,100 formed in the years 1923 and 1926-28. However, late November observations revealed a few incipient cankers which were not visible at the time of summer inspection. These may be the forerunner of a crop of cankers resulting from exposure in 1932, the peak year for telia production since the plot was started.

Stream Type Eradication Check Plots. From the data taken on 4.14 acres in 125 plots distributed along 10 drainages on the Potlatch and Clearwater Association lands, it has been found that an average of 47,264 feet of Ribes live stem per acre was reduced to 531 feet by the initial eradicative efforts. One and two years later the same plots supported 939 and 1,426 feet respectively

which is an increase of 77 percent the first year and 52 percent the second, or a total of 169 percent for the 2-year period.

On the plots in 7 drainages, data taken immediately preceding the second eradication showed an average of 1,772 feet of live stem per acre. One year later these plots had 525 feet while 779 feet were found the second year. This is a 34 percent increase in live stem per acre from one year's growth.

From these studies it is apparent that the annual growth of Ribes live stem following eradication is from one-third to three-fourths the amount on the area at the beginning of the growing season. These data also indicate the difficulty in removing those last few hundred feet of Ribes live stem from the stream type.

Canker Intensification Rate. Although no data have been compiled for these studies it was noted that there was intensification after eradication at all centers adjacent to areas eradicated of Ribes. This varied with the amounts of Ribes found on the areas, and ranged from very few to many new cankers. However, in comparison with centers in which no Ribes eradication work has been done, the intensification rate is very low.

Scouting in Northern California. Three 2-man crews spent two months scouting for blister rust in northern California. This work was done in the Klamath and Trinity National Forests and coastal fog belt in the northwestern part, Shasta National Forest in the north central part, and the Warner Mountains in the Modoc National Forest in the northeastern corner of the state. Although no blister rust was found in the parts of these areas that were covered, some excellent scouting was encountered. Of particular importance are the Marble Mountain area between the Klamath, Scott and Salmon Rivers on the Klamath National Forest and the Warner Mountains on the Modoc. Excellent western white pine in association with an abundance of *Ribes viscosissimum*, *R. lacustre* and *R. binominatum* occurs in the former area and western white pine with *R. viscosissimum*, *R. montigenum*, *R. cereum*, *R. inerme* and *R. petiolare* in the latter.

The central California region from Mt. Shasta to Mt. Lassen, which includes the McCloud, Pit and Sacramento River drainages and the eastern part of the Trinity National Forest, offers only the occasional favorable situation for rust invasion. In general this region is dry with very few Ribes or white pines, and, therefore, justifies very little scouting.

CCC CAMPS ON THE COEUR D'ALENE NATIONAL FOREST

N. D. Nelson

It was originally planned to have eleven CCC camps on the Coeur d'Alene. This was changed and six camps were allotted.

Of these six camps one was composed entirely of north Idaho boys, two were colored boys from the East, and three were boys from New York State and New Jersey.

Camp F-30 which was composed of north Idaho boys, started its construction May 17. On the fourth of June the main body arrived and immediately men were turned over to us for training. Due to rain and Saturday and Sunday no actual work was accomplished until June 12.

Every day after June 1 we waited anxiously for news as to when to expect our other five camps. Finally we heard and within two days the cadres had arrived. The cadres arrived June 19 to 20 and immediately started setting up camps. As they were tent camps everything was in readiness when the main bodies arrived on the 25th, 26th and 27th of June. Here again it was not until several days had elapsed that we got any effective work done. Training and again some rain and Saturday, Sunday and the Fourth of July made it July 5 before we got crews started on Ribes eradication.

Work progressed favorably in some camps and unfavorably in others depending upon the attitude of the camp commanders. Just as an illustration as to what interest inbuilding men and accomplishment of work can do, contrasted with the attitude that such camps should have a fine baseball park and team and to enjoy themselves as much as possible, I present these figures: Camp F-30 furnished 6,305 man days to us for blister rust control work while Camp F-27 furnished 7,142 man days. We received our first men from Camp F-30 on June 12 and from Camp F-27 July 5. The enrollment was about the same in each camp.

Camp building was facilitated in Camps F-27, 28, 29 and 30 due to the efforts and cooperation of Harry Marsh of Wallace, Idaho, who is in charge of Shoshone County relief. Carpenters were furnished each camp without any charge. Their only expense was the boarding of these men and that was not great.

In spite of all our difficulties, we accomplished some very good work, and are glad that it gave us a start in white pine protection. Control work was done on 20,288 acres, 26,113 effective man days expended, 3,081,746 Ribes eradicated with an average of 1.39 man days per acre and 164 Ribes per acre. Some of this area will need mop-up work next year but it represented a very difficult Ribes eradication job before the CCC's even touched it.

I believe that after what we learned this summer and what the Army learned that we can expect much better results from CCC labor another year.

ABOUT 33-1/3 PERCENT CLEARWATER PROJECT

B. A. Anderson

A few years ago if a project leader couldn't call every man on his particular job and at least 75 percent of the men on other Inland Empire projects by their first names, there was some question as to his fitness for his job. But how the picture changed with the advent of the CCC's and NIRA's 3,300 men on the Clearwater project, 3,600 on the St. Joe National Forest, 2,200 on the

Coeur d'Alene National Forest, and a handful of 20 men on the Savenac Nursery. Permanent personnel at first wondered where in Heaven's name the trained supervision was coming from, and then buckled into the job and furnished it. If ever an organization received a real test as to its fitness to survive, the Blister Rust organization received it last season. That does sound a bit like slapping oneself on the back but then perhaps we were all as surprised as the next fellow. When the smoke cleared away on the Clearwater project we felt gingerly of our joints and decided that we hadn't been stretched beyond the limits of elasticity. The following results had been accomplished:

Ribes Eradication Clearwater Project	1933 Work	All Previous Work
Stream type, acres	6,674.4	31,644
Upland type, acres	82,614.1	62,626
Gallons spray	163,950.0	296,650
Total Ribes	14,065,000.0	17,939,000

The above figures include all rework totals.

In addition to having done the above work, a nucleus of temporary personnel had been trained to such a degree that never more need there be any fear of being caught short-handed for supervisory personnel.

1933 was the first season a weekly progress report had ever been compiled on a blister rust project.

Slashing and burning of difficult Ribes inerme areas were developed, principally on the St. Joe, to a point where it is now considered good eradication practice.

Ribes zone maps showing the prevalence of Ribes and their exact location on all white pine areas were started. The zone maps will undoubtedly play a more and more important part in eradication work and their value will be especially apparent when areas are placed on a maintenance basis.

A system of advance checking for Ribes on white pine areas to determine whether or not crew work was necessary saved the eradication forces many effective man days of labor. This type of preliminary checking will be used for building up Ribes zone maps.

Also a checking and timber typing system was evolved by the checking project that worked to the complete satisfaction of the eradication forces; which is certainly subjecting it to an acid test.

The season finished with every project leader doing his part on a 2,000,000-acre white pine preeradication survey--part of the preparatory work for the 1934 eradication program.